KINGSTON-BEDFORD-ESSEX PARCEL DEVELOPMENT

DRAFT ENVIRONMENTAL IMPACT REPORT
EOEA NO. 6132

TRANSPORTATION IMPACT SECTIONS
FINAL DRAFT JANUARY 30, 1989

Prepared by Howard/Stein-Hudson Associates
38 Chauncy Street, Boston, Massachusetts 02111

Table of Contents

List of Figures

List of Tables

A. Transportation

1. Introduction

From a transportation perspective, the proposal to redevelop the Kingston-Bedford-Essex site presents both environmental questions and opportunities. Its location is almost ideal with respect to transit, due to the closeness of Washington Station and South Station, with the concentration of rapid transit, railroad, and bus services. Its roadway access is also convenient to the major highway system, as access to the Central Artery (I-93) and Massachusetts Turnpike (I-90) is close at hand, without long travel distances on local streets.

Kingston-Bedford-Essex also is replacing parking facilities which in their present configuration, represent a less than optimal use of land. A free-standing garage and lot will be replaced with mixed use activities which will add life to the street level and immediate area, while placing the parking underground and out of sight. This is following a trend in Boston where a number of parking facilities have been recycled into more active uses, while continuing to supply parking. These new developments include 75 State Street, Rowe's Wharf, 150 Federal Street, 101 Federal Street, 500 Boylston Street and International Place. Each of these has attempted to add vitality, economic value, and amenities to the Downtown.

With this positive backdrop, however, some serious matters must be probed. The site is located in an area of Downtown perceived by many as experiencing unacceptable traffic congestion, limited parking, and poor pedestrian access. Local access streets, albeit close to the express highways, are complex and circuitous, and must serve the adjacent community of Chinatown, pedestrians, and other development, existing and proposed. Kingston-Bedford-essex will displace existing parking and provide new parking which, as will be seen, mostly meets its own demand when viewed under existing circumstances.

The basic task of assessing and analyzing impacts will be to see how traffic operations, parking supply and demand, transit use aspects and pedestrian service are met, given established travel mode usage. The approach utilized to examine the development impacts on transportation facilities will follow the MEPA guidelines for assessment of environmental impacts, and the production of the required Environmental Impact Report.

Study Methodology. The first step was to examine existing transportation conditions within the defined study area. Further analysis examines the expected transportation conditions for the defined future study year (1993), without the development (No Build Conditions). Development impacts are then analyzed for the

most critical development alternative. As stated in Chapter 3, above, five alternatives have been developed for consideration in this DEIR, as follows:

	Office (sq. ft.)	Retail (sq. ft.)	Hotel (rooms)	Parking Spaces
400' Tower	679,000	22,000	300	800
325' Tower	554,000	26,000	240	600
250' Tower	429,000	26,000	200	600
Expanded Site	510,000	30,000	300	800
Developer's Proposal	892,000	54,000	0	873

The most critical of these with respect to transportation impacts is the 400' Tower. Since the lesser alternatives do not produce a substantial difference in transportation impacts, they are examined only in relative terms to the critical development alternative. (The proposed Kingston-Bedford-Essex development alternatives are previously described in Chapter 3.)

Transportation mitigation measures are also analyzed for the most critical development scenario and will therefore accommodate the alternatives that produce lesser impacts. The transportation mitigation measures are suggested, such as improvements to the study area roadway and intersection network, and transit and ridesharing incentives.

In undertaking these analyses, care has been taken to see that the effects of other planned developments, with their own additional access demands, are taken into account. In addition, without having a Downtown development and transportation master plan, assumptions had to be made with respect to the future available street network. These assumptions are set forth in the appropriate sections. Summarized, major goals of the analysis were:

- to channel traffic away from purely local streets;
- to avoid reliance on future street segments which may not be created; and
- to avoid reliance on existing street features which are subject to elimination.

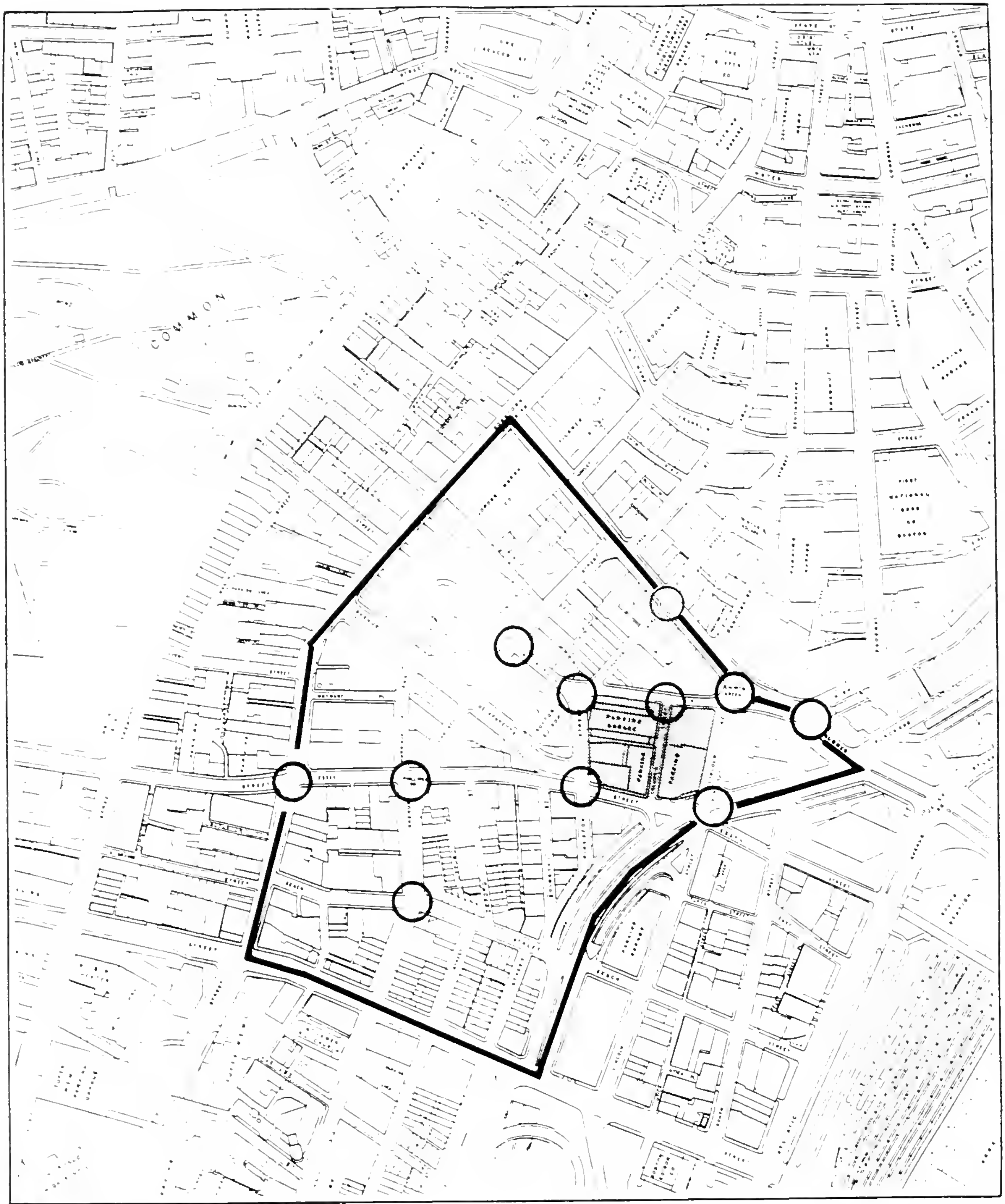
2. Description of the Environment

Current traffic flow conditions, and data on public transportation and pedestrian activity were obtained by reviewing available information and reports, conducting an engineering reconnaissance of the affected roadway and public transportation facilities, and analyzing traffic volume data for key roadway segments and intersections.

Vehicular Access. The boundaries of the traffic impact study area were defined by those street segments which will be directly affected by site-generated traffic. The roadway network as defined for the study area is identified in Figure IV A-1. The general limits of the area are: Summer Street to the north, Kneeland Street to the south, the Surface Artery to the east; and Washington Street to the west. Traffic operations were analyzed at the following intersection locations within this area:

- Summer/High/South;
- Summer/Lincoln/Bedford;
- Summer/Otis/Kingston;
- Bedford/Columbia;
- Bedford/Kingston;
- Bedford/Chauncy/Lafayette Place Garage;
- Surface Artery/Essex/Lincoln;
- Essex/Kingston/Avenue de Lafayette;
- Essex/Harrison/Chauncy;
- Essex/Washington; and
- Harrison/Beach.

Although other streets in the surrounding area will be used by a portion of the anticipated site traffic, the impact of these lower volumes will be negligible.



HOWARD/STEIN-HUDSON ASSOCIATES

TRAFFIC ANALYSIS STUDY AREA
○ ANALYSIS INTERSECTIONS

N

Figure IV A-1

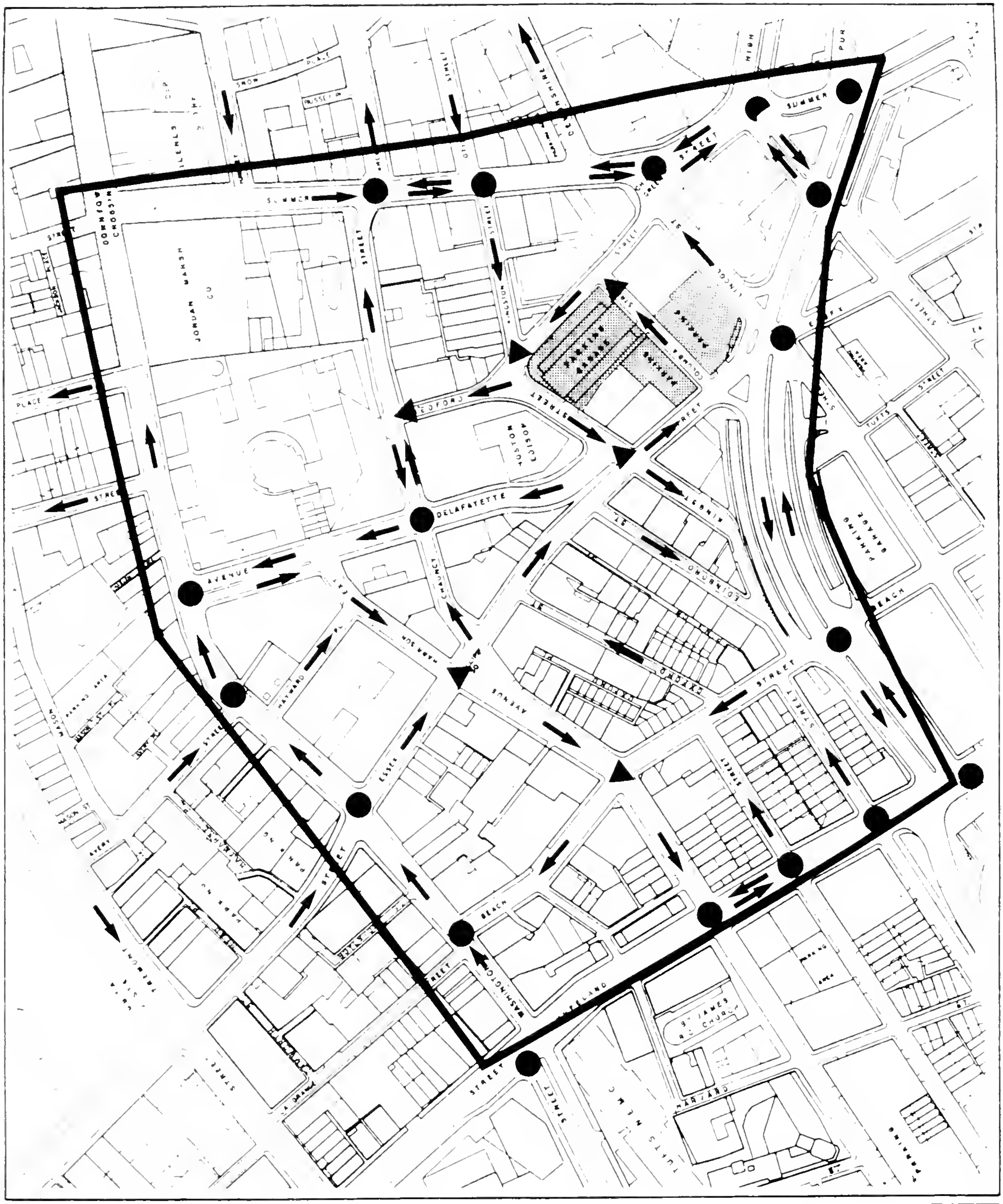
Study Area Regional Access. Regional access to the Kingston-Bedford-Essex site is provided by the Massachusetts Turnpike (I-90) and the John F. Fitzgerald Expressway (I-93, Central Artery, Southeast Expressway). Arterial streets which provide access from these major highways include Lincoln Street, South Street and Atlantic Avenue from the south, the Surface Artery from the north and south, Summer Street from the east, and Essex Street from the west. Much of the roadway network in the study area is designated as one-way streets. Figure IV A-2 depicts the study area traffic circulation patterns and the associated traffic control devices at intersections.

For access from I-90 and from I-93 south of the site, the most direct connection to the surface street system is via the ramps at the I-90/I-93 interchange. The off-ramp from I-90 leads to the Kneeland Street/Atlantic Avenue intersection. The I-93 off-ramp intersects Kneeland Street at Lincoln Street. Both off-ramps are located approximately 1/4 mile south of the site. Access from I-93 north of the site is via the off-ramp to Purchase Street/Summer Street or further north at the High Street off-ramp.

The on-ramps for I-90 and I-93 are also located within a short distance of the site. An on-ramp located southwest of the site at the Kneeland Street/Surface Artery intersection serves traffic accessing I-90 westbound and I-93 southbound. The I-93 northbound on-ramp is located approximately 300 feet east of the site along the Surface Artery at South Street.

Existing Traffic Volumes. Traffic volume data were obtained from daily and peak hour turning movement counts recorded by WCH Industries for this DEIR in 1986. Results were compared with more recent traffic counts conducted by the City of Boston Transportation Department and with information in the following reports: Draft Dewey Square Comprehensive Transportation Systems Management Program (Boston Redevelopment Authority, 1984), Transportation Impact Study and Access Plan, 125 Summer Street Development (Vanasse/Hangen Associates, 1986), the Commonwealth Center Transportation Impact Study (Sasaki Associates, 1988) and the Midtown Cultural District Plan (transportation elements), TAMS, 1988.

Existing average daily traffic (ADT) volumes on study area roadways are indicated in Figure IV A-3. Daily volumes were recorded by Automatic Traffic Recorders (ATR's) placed on various street segments. A summary of these counts is provided in Appendix T1. Daily traffic volume estimates were developed for other street segments by multiplying the peak hour approach volume at selected intersections along the street by the ratio of the recorded daily volume to the peak hour approach volume for the intersecting street.



HOWARD/ STEIN- HUDSON. ASSOCIATES

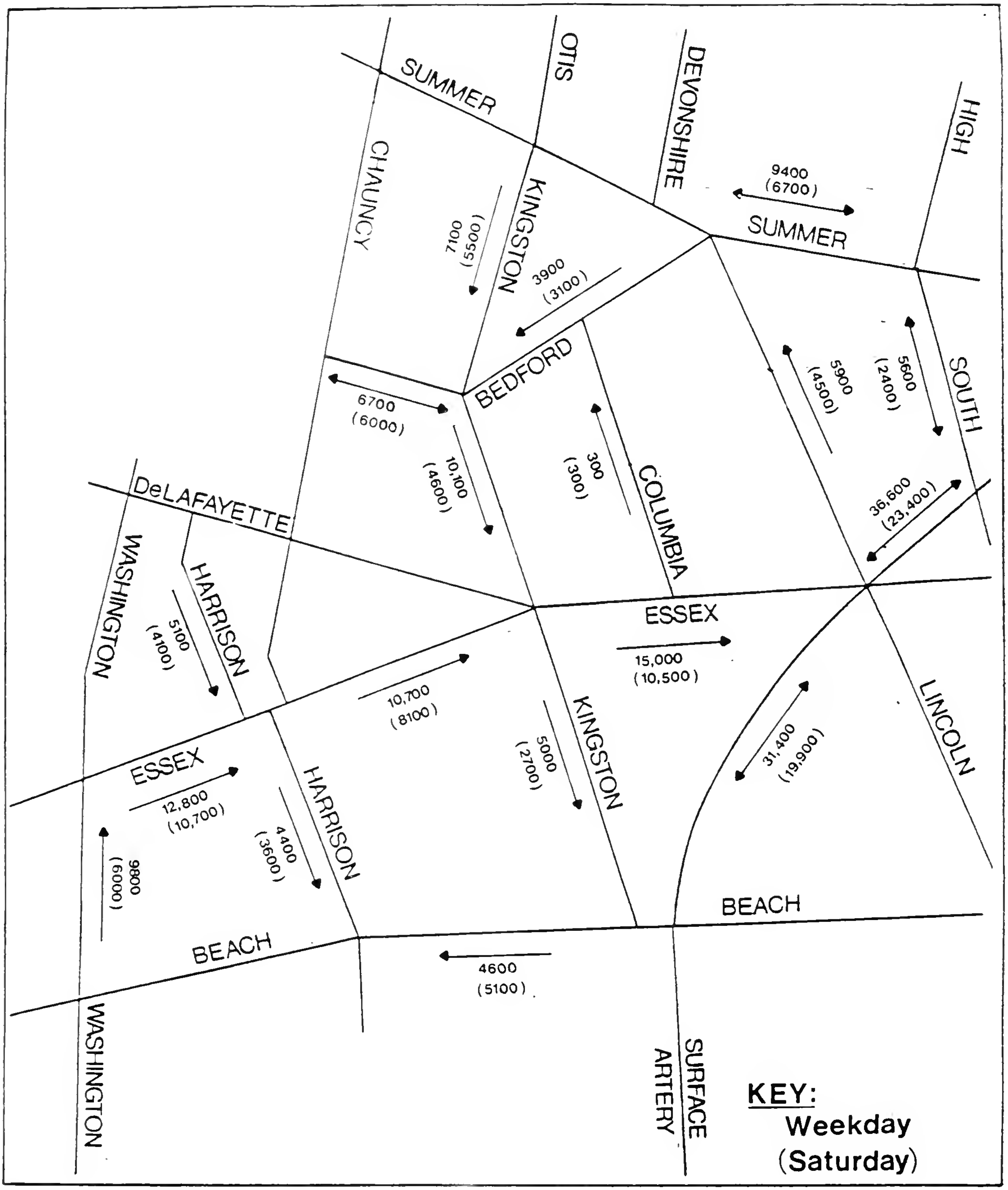
STUDY AREA TRAFFIC CIRCULATION

KEY: ● TRAFFIC SIGNAL CONTROL

▲ STOP SIGN CONTROL

N

Figure IV A-2



HOWARD/STEIN-HUDSON ASSOCIATES

EXISTING (1988) CONDITIONS - DAILY TRAFFIC VOLUMES

N

Figure IV A-3

Hourly traffic data at study area intersection locations for the morning and evening weekday peak hours and the Saturday peak hour were obtained from manual turning movement counts. Volumes were recorded every 15 minutes. Results of these counts are shown in Figures IV A-4 through IV A-6. A tabular summary is provided in Appendix T2. It was not necessary to balance the intersection counts in this complex downtown network for purposes of traffic capacity analysis; rather, the highest peak hour for each intersection was derived from the fifteen minute volume sumamries to represent a "worst case" condition.

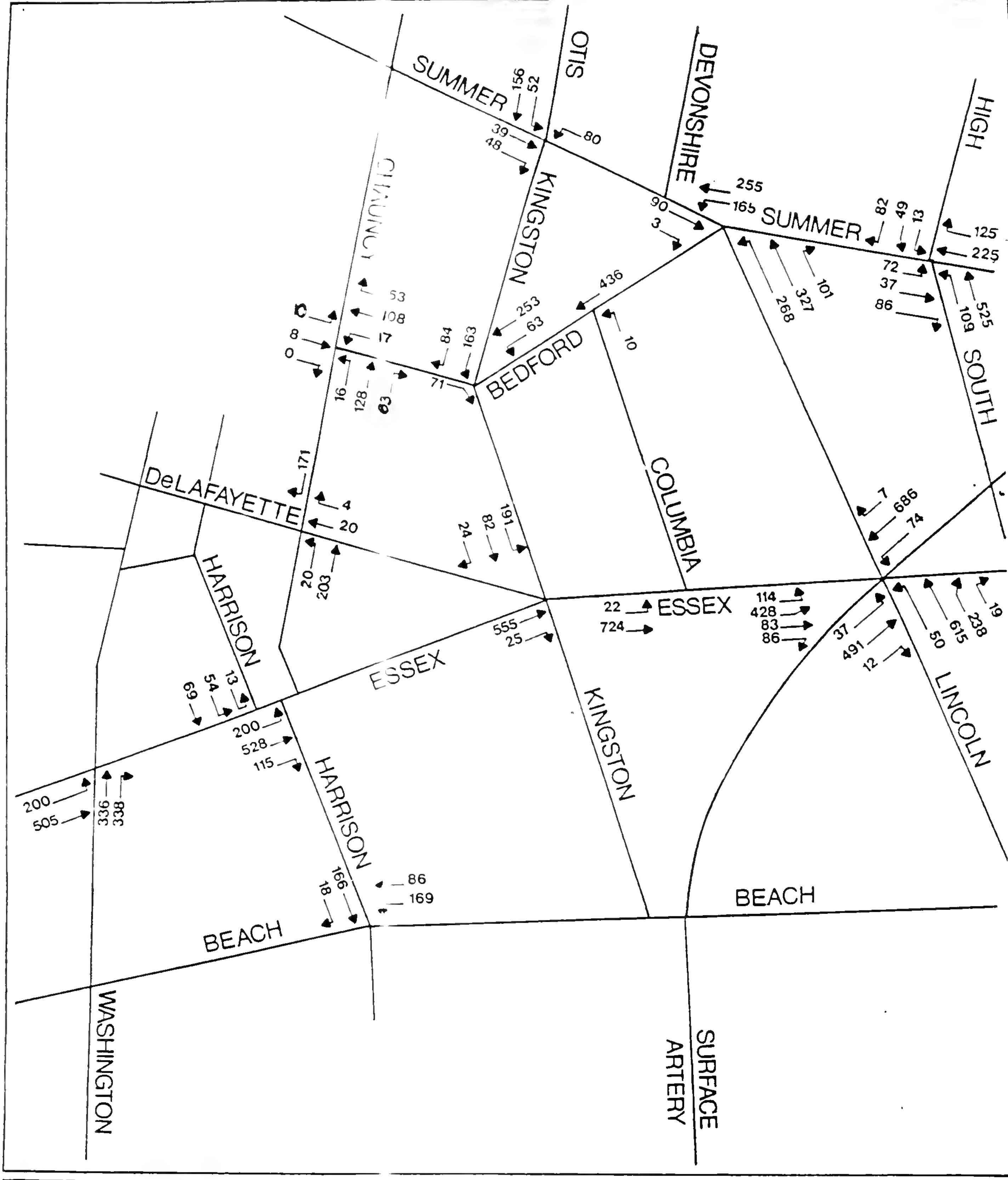
The data indicate the weekday morning peak hour traffic to generally occur between 8:00 and 9:00 AM. The peak hour of weekday evening traffic varies widely, although all intersections recorded peak volumes within the 4:00 and 6:00 PM time period. The peak hour of traffic on a Saturday generally occurs during the early afternoon period between 1:45 and 2:45 PM.

Existing Traffic Operations. Traffic operations are analyzed in terms of level of service (LOS) during these peak hour traffic periods at intersection locations. The capacity of an intersection or roadway facility is the maximum number of vehicles which can be reasonably expected to traverse a roadway segment and/or intersection approach during a specific time period, given the physical and operational characteristics of the facility.

Level of service for signalized intersections is defined in terms of delay. Level of service criteria for signalized intersections are quantified according to the average stopped delay per vehicle over a 15 minute analysis period. Another indication of the operational LOS is a comparison between the intersection capacity and the actual traffic volumes using (or expected to use) the roadway facility. The relationship between approach delays, volume-to-capacity ratios and LOS designations for signalized intersections is summarized in Table IV A-1.

Level of service criteria for unsignalized intersections are defined by the reserve, or unused capacity of the minor (i.e, or controlled) approach. The analysis of unsignalized intersections is based primarily on the ability of vehicles along the minor approach to cross or turn through the traffic stream along the major approaches. This analysis procedure requires that the intersection right-of-way be clearly defined, resulting in a situation where drivers on the minor street must use judgment to select acceptable gaps in the major street flow through which to execute turning maneuvers. Therefore, the capacity of a controlled approach is dependent on two factors, as follows:

1) the distribution of gaps in the traffic stream along the major street; and

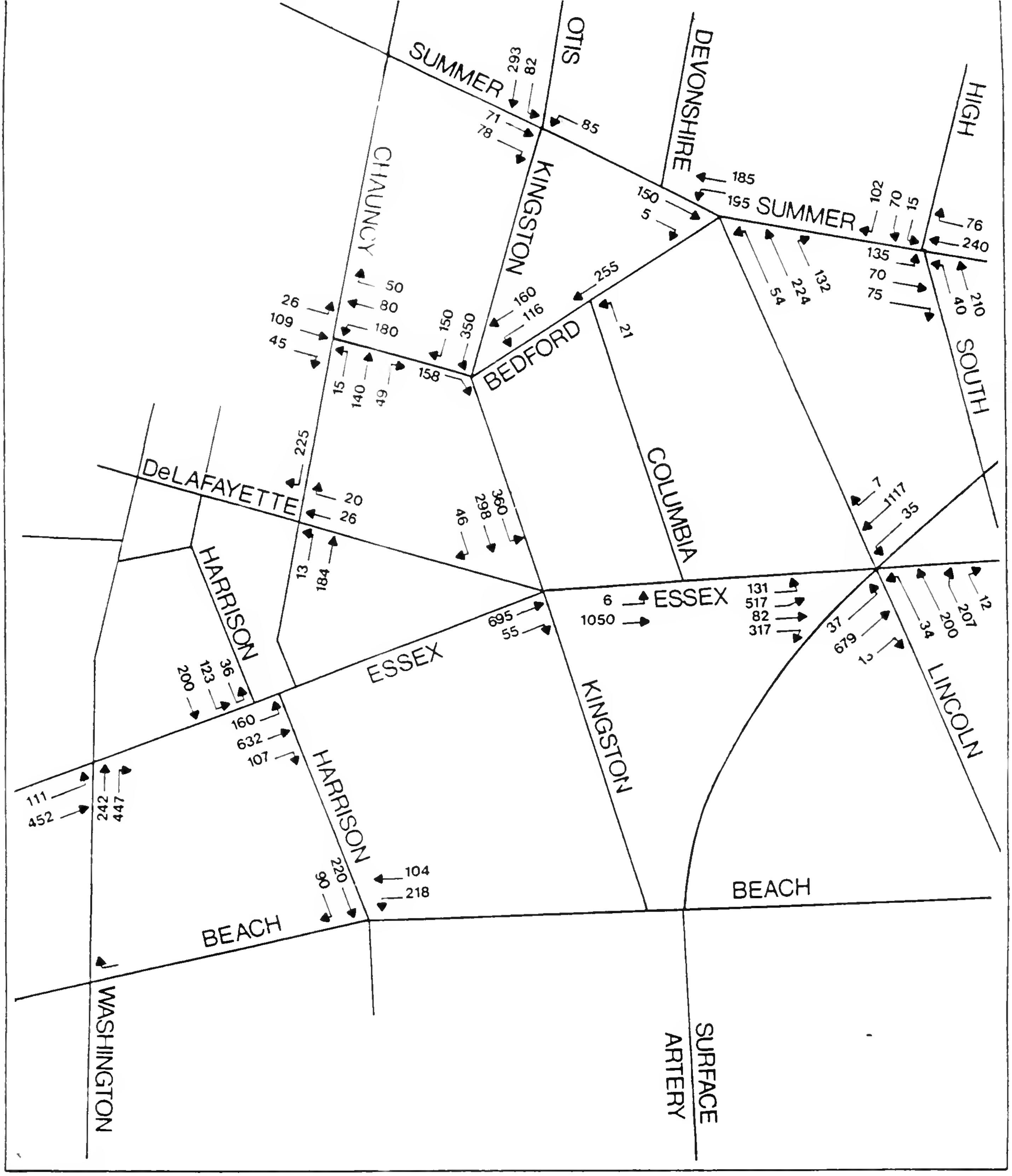


EXISTING (1988) CONDITIONS -
AM PEAK HOUR TRAFFIC VOLUMES

HOWARD/STEIN-HUDSON ASSOCIATES

N

Figure IV A-4

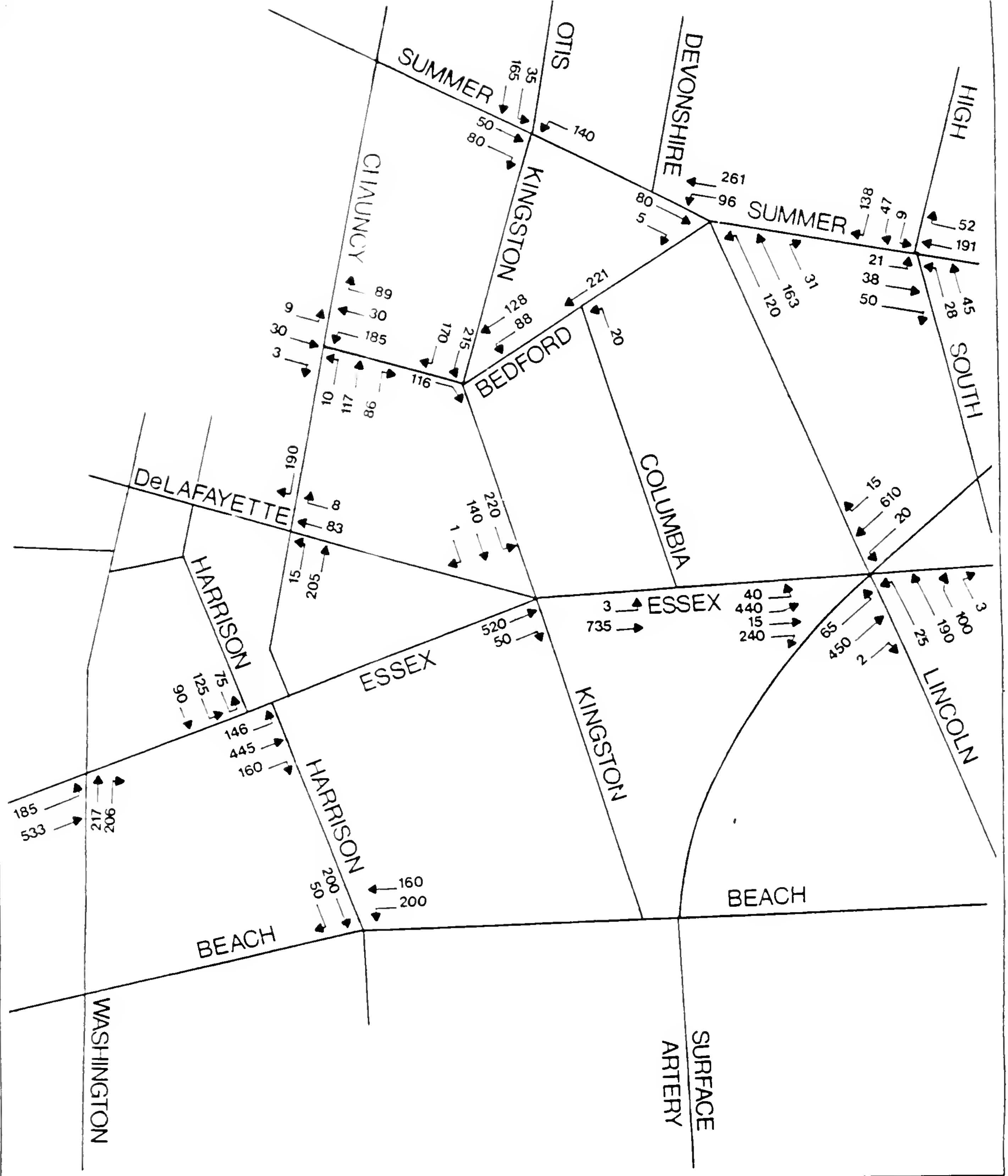


HOWARD/STEIN-HUDSON ASSOCIATES

EXISTING (1988) CONDITIONS -
PM PEAK HOUR TRAFFIC VOLUMES

N

Figure IV A-5



HOWARD/STEIN-HUDSON ASSOCIATES

EXISTING CONDITIONS -
SAT. PEAK HOUR TRAFFIC VOLUMES

N

Figure IV A-6

Table IV A-1
Intersection Level of Service (LOS) Designations (1)

Level of Service	Description	Delay Range (2) Seconds per Vehicle	Reserve Capacity (3) (Vehicles per Hour)
LOS A	Describes a condition of free flow, with low volumes and relatively high speeds. There is little or no reduction in maneuverability due to the presence of other vehicles, and drivers can maintain their desired speeds with little or no delay.	0.00-5.0	400
LOS B	Describes a condition of stable flow, with desired operating speeds relatively unaffected, but with a slight deterioration of maneuverability within the traffic stream.	5.1-15.0	300-399
LOS C	Describes a condition still representing stable flow, but speeds and maneuverability begin to be restricted. The general level of comfort begins to deteriorate noticeably at this level.	15.1-25.0	200-299
LOS D	Describes a high-density traffic condition approaching unstable flow. Speeds and maneuverability become more seriously restricted, and the driver experiences a poor level of comfort.	25.1-40.0	100-199
LOS E	Represents conditions at or near the capacity of the facility. Flow is usually unstable, and freedom to maneuver within the traffic stream becomes extremely difficult.	40.1-60.0	0-99
LOS F	Describes forced-flow or breakdown conditions with queueing along critical approaches. Operating conditions are highly unstable as characterized by erratic vehicle movements along each approach.	60.1 or greater	NA

---

1) Source: Transportation Research Board, <u>Highway Capacity Manual</u>, Special Report 209, National Research Council, 1985

2) Delay ranges relate to the mean stopped delay incurred by all vehicles entering the intersection for the movement or movements under consideration and do not consider the effects of traffic signal coordination. This criterion is intended for use in the evaluation of signalized intersections.

3) Reserve capacity refers to the unused capacity of the minor approach, on a per lane basis. This criterion is limited to use in the evaluation of unsignalized intersections.

2) driver judgment in selecting gaps in the major stream through which to execute turning movements.

The volume using the major intersection approaches is a governing factor in the capacity determination for the minor approach. The reserve capacity at the minor approach is subsequently determined by calculating the difference between the capacity of the intersection at LOS F and the actual approach volume, adjusted to account for traffic stream characteristics and intersection geometrics. Reserve capacity is usually defined on a per lane basis for a peak hour analysis period.

From a traffic operations standpoint, LOS C or better is generally considered an "acceptable" condition. LOS D may also be acceptable in urban conditions. LOS D represents conditions where the peak hour demands are less than the capacity of the roadway or intersection, but where speeds are considerably reduced and delays increased. LOS E represents operations at or near capacity where delays to critical approaches are significant.

Table IV A-2 shows existing traffic operations at study area intersections for weekday morning, weekday evening, and Saturday afternoon peak hours.[1] All traffic operations analyses were conducted assuming **full** enforcement of existing traffic and parking regulations along study area streets. Although current lack of parking restriction enforcement measures (tow zones) produces poorer traffic operations than those indicated in the analyses, the results are used for comparative purposes with the No Build and 400' Tower Conditions, where these restrictions are assumed to be fully enforced. The operations analyses are provided in Appendix T3.

The analyses indicate traffic operations at study area intersections to be at acceptable levels of service (LOS D or better) during the morning peak hour period. The intersection of Essex/Harrison/Chauncy is the only location during the morning peak hour which operates at LOS D; all other locations operate at LOS C or better.

Traffic operations during the evening peak hour period, however, are decidedly worse, especially for unsignalized locations along the Essex Street corridor. The Essex/Harrison/Chauncy Street intersection operates at LOS D for southbound vehicles along Harrison Avenue approaching Essex Street. This location also operates poorly (LOS F) during the Saturday peak hour period.

----

1. The intersection capacity analyses were conducted in accordance with the guidelines of the Transportation Research Board's Highway Capacity Manual (Research Report 209), utilizing the <u>Capacity of Intersections: CTPS' HCM Program</u> (CINCH) as suggested in the EOEA guidelines for traffic impact analyses.

Table IV A-2

Existing (1988) Conditions - Traffic Operations Summary

SIGNALIZED INTERSECTIONS

Intersection Location	AM PEAK HOUR LOS	AM PEAK HOUR Average Delay	PM PEAK HOUR LOS	PM PEAK HOUR Average Delay	SAT PEAK HOUR LOS	SAT PEAK HOUR Average Delay
Summer/High/South	B	10.96	B	7.20	B	7.37
Summer/Lincoln/Bedford	B	8.82	B	10.47	B	8.30
Summer/Otis/Kingston	B	6.76	B	6.68	B	6.99
Surface Artery/Essex/Lincoln	C	15.14	C	18.81	B	12.97
Essex/Washington	B	8.25	B	8.81	B	7.34

UNSIGNALIZED INTERSECTIONS

Intersection Location	AM PEAK HOUR LOS	AM PEAK HOUR Reserve Capacity	PM PEAK HOUR LOS	PM PEAK HOUR Reserve Capacity	SAT PEAK HOUR LOS	SAT PEAK HOUR Reserve Capacity
Bedford/Columbia						
Columbia NB	A	489	A	818	A	744
Bedford/Kingston						
Kingston SB	A	435	D	115	B	378
Bedford/Chauncy/LP Garage						
Lafayette Ent. EB	A	824	A	668	A	815
Bedford WB	A	510	B	326	A	506
Essex/Kingston/Ave. de Lafayette						
Kingston SB						
LT	C	263	F	0	C	247
TH	A	463	D	131	C	416
Essex/Harrison/Chauncy						
Harrison SB						
LT	D	184	D	125	F	0
TH	C	233	D	133	D	175
Harrison/Beach						
Beach WB	A	504	B	317	B	355

The Essex/Kingston/Avenue de Lafayette intersection operates at LOS F for southbound left turns from Kingston Street to Essex Street, while through movements operate at LOS D. The Bedford/Kingston intersection also operates at LOS D during the evening peak hour period. All of these intersections are not signalized at the present time.

Public Transportation System. The Kingston-Bedford-Essex site is ideally situated for both local and regional public transit access. It is at the hub of the regional public transportation system, where subway, light rail, commuter rail and express buses converge. In addition, the site has good access to local bus routes which connect the core of the downtown commercial area with other city neighborhoods.

For this development, as well as other downtown land uses, good transit access is an important part of the attractiveness of the site to employees and visitors, and such strong transit access is important in supporting the economic vitality of the site and the activities that occur there.

The city and region have enjoyed a recent period of heightened public and private attention to the importance of maintaining and enhancing the region's transit service network. The MBTA has undertaken major capital investment and service improvement efforts, most notably the new Orange Line in the Southwest Corridor. In addition, a significant effort has been underway to expand the capacity of the transit system by adding cars and increasing the length of rapid transit trains. Major improvements have also been made to the South Station and Downtown Crossing/Washington Street stations near the project location. Such improvements provide a positive context for transit service both near the Kingston-Bedford-Essex site and in the regional system which converges in the downtown core.

The site's proximity to South Station, planned as a major regional transportation center, will enhance the accessibility and attractiveness of the site to users. South Station is expected to serve not only as a commuter rail hub, which it does already, but as a truly intermodal facility. Greyhound Bus Lines will relocate from its current Stuart Street location to an expanded South Station location. In addition, South Station will provide express service to and from Logan airport.

The Massachusetts Bay Transportation Authority continues to implement plans for expanding capacity on both its rapid transit lines and on its commuter rail lines. Until 1988, four-car trains were the peak-hour norm on both the Red line and Orange line trains. Currently, the running of six-car trains during peak hours has added capacity on each line. The MBTA is currently looking at lengthening the stations on the Blue line, permitting the running of six-car trains and increasing the capacity of the line and the system.

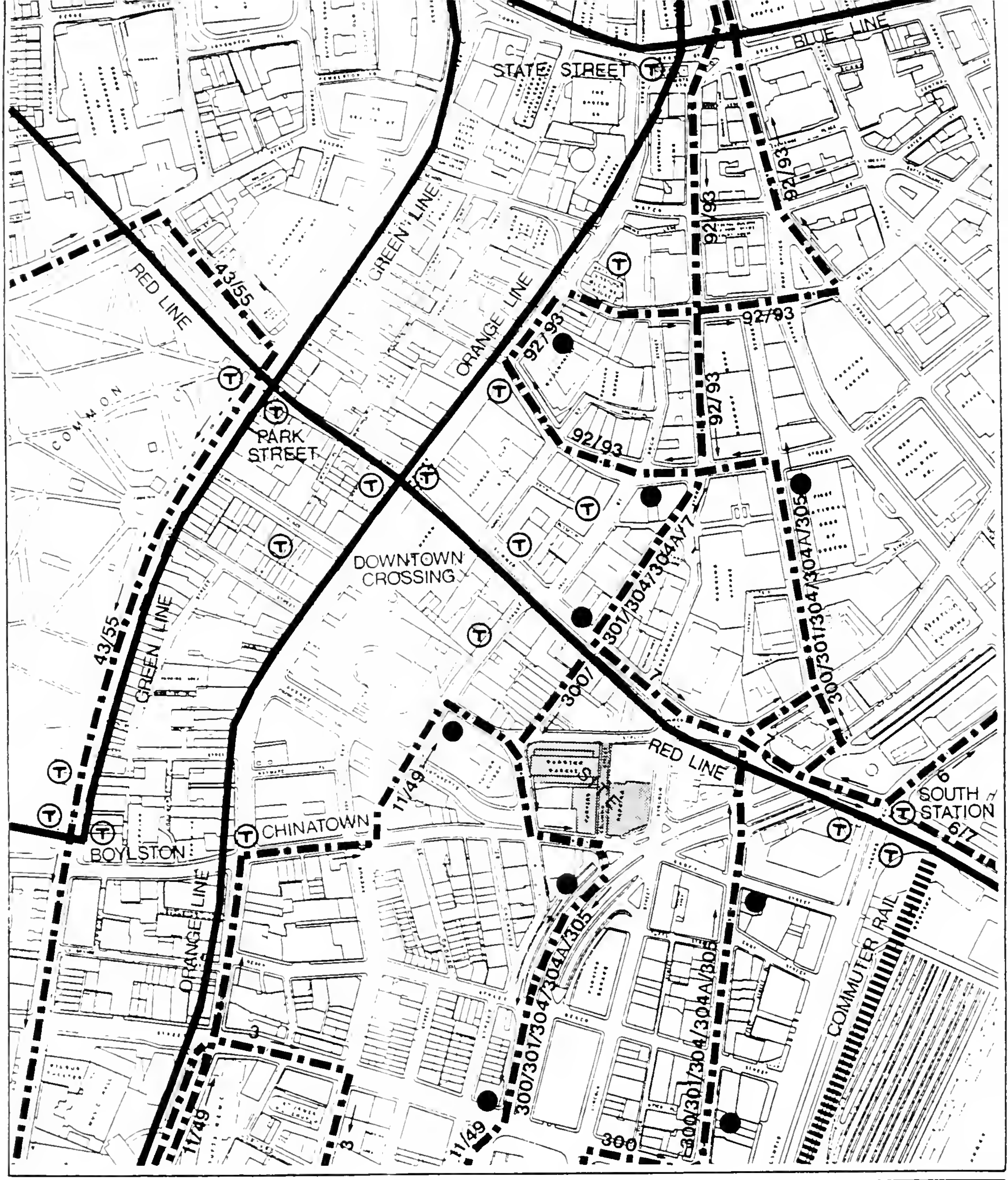
The MBTA is also studying the feasibility of extending its commuter rail lines as well as adding additional lines where ridership projections warrant. Currently, the MBTA is researching several commuter rail extensions to Route 495 and beyond. To allow increased use of their existing lines, the Authority is putting resources into expanding its park-and-ride facilities. The MBTA already has almost 14,000 parking spaces to serve its rapid transit lines, and 11,600 spaces to serve its commuter rail lines. Studies are underway to investigate expansion of parking facilities throughout the MBTA system.

As a result of these planned projects, the capacity of the public transportation will be expanded in future years beyond the build year of the project.

<u>Existing Conditions</u>. The Kingston-Bedford-Essex site is well located with respect to several rapid transit stations. One can walk in well under five minutes from the site to South Station (800-900 feet east of the site) serving the Red line, the Chinatown station (900-1000 feet west) serving the Orange line and Downtown Crossing (900-1100 feet northeast), serving both the Red and the Orange lines. One can walk within five minutes to Park Street Station, serving the Green line as well as the Red line.

The site is also within two blocks of several public express bus lines. These are the numbers 300, 301, 304, 304A, and 305, serving Riverside, Brighton Center, Watertown, Newton Corner, and Waltham. Private express buses connecting South Shore communities with downtown also stop close to the project site at South Station, and at least four local bus lines stop within five blocks of the site. Due to the excellent availability and accessibility of public transit in the vicinity of the site, it is expected that many of the trips generated by the development will use mass transit.

Finally, the site is well located with respect to regional and national transportation. South Station, in addition to serving as a rapid transit station, serves as a regional transportation hub. It is the downtown terminal for commuter rail lines serving communities both south and west of Boston, including Framingham, Franklin and Providence, Rhode Island. South Station is the northeastern-most transit terminal for Amtrak national railroad service. Intercity buses also serve the area at the Dewey Square terminal and, to the west of the project site, at Park Square. The transit lines and stations in the vicinity of the project site are shown in Figure IV A-7.



HOWARD/STEIN-HUDSON. ASSOCIATES

MBTA BUS AND RAPID TRANSIT LINES AND STATIONS

N

Figure IV A-7

Existing Public Transportation System Capacity and Ridership. In order to estimate the impact of the project on the public transportation system and the system's capacity to serve the development, existing and future transit capacity and ridership figures have been developed. In this analysis, emphasis has been placed on the rapid transit system, as this is the primary means of providing transit service to the project site. While project employees and visitors are expected to use MBTA express buses as well, the MBTA has a policy of expanding bus service as ridership grows. Thus, they are not as capacity constrained as are the fixed rail systems serving project users.

The concept of public transportation system capacity is defined in terms of the passenger carrying capability of the system's stairways, turnstiles, platforms, and vehicles for a given time period, typically a peak 2-3 hour period, a one-hour peak, or even a 15-minute peak period. In downtown Boston, unlike larger cities such as New York or Chicago, stairway capacity has not been a problem for downtown stations. Prior station modernization programs have improved turnstile capacity and station amenity at most downtown stations. In addition, recent MBTA station modernization programs and platform lengthenings to accommodate six car trains have largely relieved overcrowded platform conditions for the Red and Orange Lines. Work is ongoing in 1988 to further improve Washington Street station, with existing entrances being refurbished, a new entrance and elevator created within the 101 Arch Street development, and a new Franklin Street entrance created in Filene's Park. South Station improvements are under construction. All downtown stations are currently accessible to the handicapped, with the exception of the Chinatown Orange Line station. At this location, the MBTA is evaluating the feasibility of creating a new entrance and elevator, possibly in conjunction with the 600 Washington Street development. Thus, the actual carrying capacity of the trains themselves is the major transit impact issue.

Line capacity for a given transit schedule is a function of the number of trains per hour (headway), the number of cars per train, and the number of passengers per car. For this study, capacity was estimated through the following steps:

- determining for each line the number of peak hour trains (sixty minutes divided by the scheduled headway). To meet a given schedule for trains in both directions may require more or less total trains than will actually pass through a checkpoint in the peak hour, depending on the running time for the round trip. Thus, the total number of trains available will not equal the actual number of trains running in the peak one hour period.

- calculating the total number of peak hour cars -- number of trains multiplied by number of cars per train. This parameter varies for each line.

- calculating the total number of passengers -- number of cars multiplied by the passenger carrying capacity of each car. For this study, capacity is defined as the seating capacity for each type of car, plus the number of standees which could be accommodated at 2.5 square feet per person -- or approximately 3 passengers per seat. This is equivalent to a "Level of Service E" according to the <u>Highway Capacity Manual</u>. By comparison, "crush loading" is determined on the basis of 3 to 3.8 passengers per seat.

The data upon which current transit line capacity calculations have been based is included in Table IV A-3. Table IV A-4 summarizes the current capacities and ridership for the peak direction at the peak station/link in the peak hour for the Red, Orange, Blue and Green Lines.

As illustrated in Table IV A-4, the lines where existing ridership approaches or is at the capacity of the system in the peak hour are the Blue Line and the Braintree Branch of the Red Line at Andrew. The MBTA has addressed this situation by adding "Run as Directed" (RAD) trains, as shown in Table IV A-3. In the case of the Red Line, three peak period six-car trains are available to supplement Ashmont and South Shore service on an unscheduled basis, each of which makes one trip in each direction during the peak hour. This capability raises potential Red Line peak hour carrying capacity by 3,240. One extra "RAD" train is available to serve the Blue Line.

<u>Pedestrian Environment</u>. The Kingston-Bedford-Essex site is ideally situated for pedestrian access given its location near the retail center of Downtown, with excellent access to nearby transit stations and terminals, parking and other office, retail, governmental and recreational facilities. The development of surrounding parcels formerly occupied by parking facilities -- 99 Summer Street, for example -- has served to bring new ground level retail uses and pedestrian activity to an area which had been somewhat of a barrier in the past between the retail area and South Station, the Leather District and Chinatown.

Pedestrian volumes in the study area are based upon a combination of field counts taken by WCH Industries and by Vanasse/Hangen Associates (1986). Table IV A-5 provides a summary of the counts taken during the morning and afternoon peak periods. These volumes do not necessarily occur at the same time

Table IV A-3

Existing (1988) MBTA Rapid Transit Peak Hour and Line Capacity

Line/Segment	Cars/ Train	PM Peak Sched. Headway	PM Peak Hr. Trains	PM Peak Hr. Cars	Car Capac.	PM Peak Hr. Capac.
ORANGE						
Oak Grove - Forest Hills	6	4.5 min	14	84	155	13020
	4	4.5 min	4	16	155	2480
Total			18	100		15500
GREEN						
N. Sta. - Cleveland Cir.	2	7 min	7	14	165	2310
Cleveland Cir. (RAD)	1		7	7	165	1155
Gov't Center - Boston Col	2	6 min	12	24	165	3960
Gov't Center - Riverside	2	6 min	12	24	165	3960
	1		3	3	165	495
Brigham Circle - Lechmere	2	8 min	8	16	165	2640
Lechmere - (RAD)	1		8	8	165	1320
Total			57	96		14816
RED						
Alewife - Ashmont	4	8 min	7	28	180	5040
	6		5	30	180	5400
Braintree - Alewife	4	8 min	5	20	180	3600
	6		9	54	180	9720
Run As Directed (RAD)	6		3	18	180	3240
Total Red Line			29	150		27000
BLUE						
Bowdoin - Wonderland	4	3-4 min	15	60	110	6600
Run as Directed" (RAD)	4		1	4	110	440
Total			16	64		7040
TOTAL TRANSIT LINES			120	410		64356

** Note: excludes Mattapan trolley service feeding Ashmont Station

Source: MBTA, Operations Directorate, Planning Division:
Ridership and Service Statistics, October, 1988
Letter from Michael Burns, December, 1988 (see Appendix)

Table IV A-4

Existing (1988) Transit Capacities and Ridership
Peak Hour, Peak Direction

Peak Load Points	Scheduled Capacity*	Av. Passenger Load **
RED LINE		
Between Andrew and JFK (Ashmont)	10,440	5,400 (PM)
Between Andrew and No. Quincy (Braintree)	13,320	7,350 (PM)
BLUE LINE		
Between Maverick and Aquarium	7,040	6,750 (AM)
ORANGE LINE NORTH		
Between Haymarket and North Station	15,500	9,300 (AM) 8,900 (PM)
ORANGE LINE SOUTH		
Between Back Bay and NEMC	15,500	8,800 (AM) 7,650 (PM)
GREEN LINE WEST		
Between Arlington and Copley	12,341	10,000 (#)
GREEN LINE NORTH		
Between No. Station & Science Park	2,640	1,100 (#)

* See Table IV A-3 for capacity analyses

** Sources: MBTA Ridership and Service Statistics, Operations Directorate, Planning Division, October, 1988 page 2-8; letter from Michael Burns to Howard/Stein-Hudson, December, 1988, (included as Appendix T4).

\# 1986 estimate: 125 High Street DEIR, Vanasse/Hangen, Inc.

as the peak vehicular flow for the intersections. The most significant pedestrian activity occurs during the AM and PM peak hours along Summer Street, reflecting commuter travel to and from South Station. Pedestrian flow during the peak hours and on Saturday is primarily in an east-west direction. The other intersections have pedestrian volumes of fewer than 200 pedestrians per hour. These are easily accommodated by area sidewalks, and are summarized in the "low" and "moderate" category for purposes of the traffic capacity analyses.

Table IV A-5

Existing Pedestrian Volumes
(Weekday AM/Weekday PM/Saturday PM)

Intersection	North Crosswalk **	South Crosswalk	East Crosswalk	West Crosswalk
Summer/Lincoln/Bedford	NA/NA/NA	210/230/10	1190/1286/108	138/191/16
Bedford/Columbia	NA/NA/NA	30/66/112	237/100/14	143/22/38
Bedford/Kingston	233/238/94	88/79/84	122/157/60	154/180/79
Surf. Art./Essex	281/257/50	91/96/85	242/199/39	29/36/26
Essex/Lincoln	163/145/98	15/200/43	242/199/39	19/36/26
Essex/Columbia	129/138/90	NA/NA/NA	27/44/47	20/16/42
Essex/Kingston/ Ave. de Lafayette	145/180/NR	89/96/NR	28/40/NR	61/78/NR

NA: not applicable -- no crosswalk volumes on this leg of a "T" intersection.
NR: not recorded - assumed to be lower than weekday volumes, similar to the other intersections
* City of Boston Transportation Department pedestrian counts recorded on July 23, 1986

In general, the downtown streets are narrow, and traffic volumes sufficiently low and slow moving that pedestrian movement is not obstructed. For most interior streets, the primary cause of conflicts or safety problems for pedestrians is building and street construction activity which necessitates use of temporary walkways, creates holes in streets which block certain paths, or prohibits certain street crossings. However, the Surface Artery and Central Artery ramps near South Station do pose pedestrian problems in terms of fast moving traffic and inconvenient pedestrian crossings. Ongoing City street improvement plans and building site plans will improve these situations over time.

Parking. For purposes of analyzing parking supply and demand, a study area broader than that of the traffic analysis study area was fixed in consultation with the City of Boston Transportation Department and the Boston Redevelopment Authority. This area, which accounts for downtown destinations of 91% of current Kingston/Bedford parkers, is shown in Figure IV A-8.

The project site presently accommodates approximately 731 parking spaces, including an estimated 550 spaces (practical capacity) in the mechanical Kingston/Bedford Garage, 51 spaces in the Essex St. lot west of Columbia Street and 130 spaces in the Lincoln/Essex lot to the east of Columbia Street. All of the parking is open to the public. The largest garage facilities in the study area are the Lafayette Place Garage (1,050 spaces), Winthrop Square Garage (1,125 spaces) and the Kingston/Bedford Garage (550 spaces).

There are also various small off-street surface parking lots. As shown in Table IV A-6 and Figure IV A-8, 5,424 total off-street parking spaces existed in the study area in 1988, of which 10% (537 spaces) were in lots and 90% (4,887 spaces) were in garages. Of these, 80% were open to the public and 20% were reserved for employees. These spaces served a study area office/retail employee population estimated at 40,000 for 1986. In 1986, when last surveyed, peak occupancy, at 12-1 PM, was 4,798, or 88% of capacity. The all-day rates for public parking varied from $4.40 at the Winthrop Square Garage to $19.00 at 150 Federal Street, with a typical all-day rate in the $10-12 range.

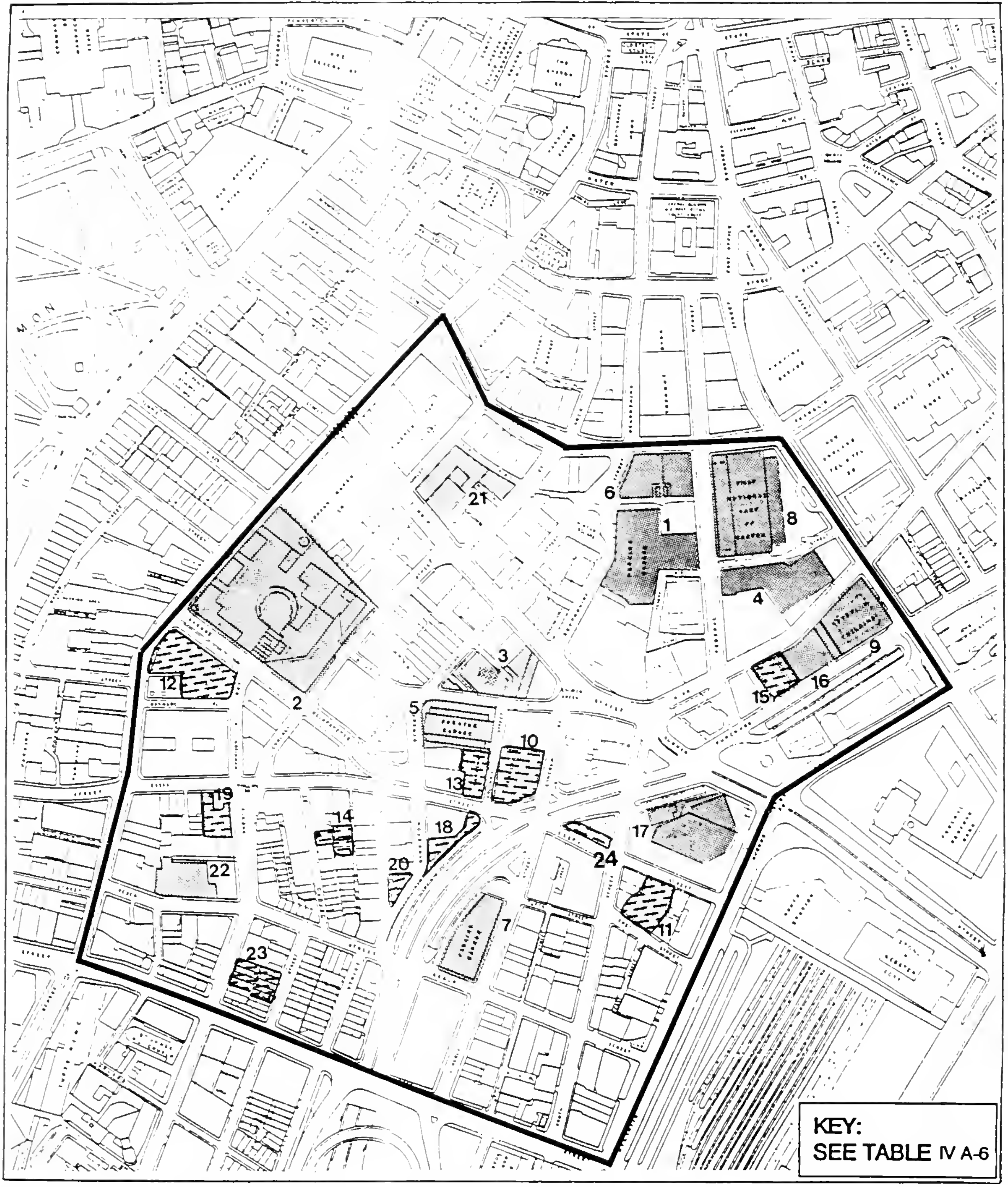
On-street parking is quite limited within the study area. For traffic control purposes, a significant proportion of the on-street spaces are signed "No Parking" during the weekday commuter periods (7:00 - 9:30 AM and 4:00 - 6:00 PM). The available on-street parking supply is fully utilized by midday (125 Summer Street Transportation Impact Study, Vanasse/Hangen, 1986).

To determine the characteristics of current parkers in the vicinity of the project site, detailed parking occupancy, turnover, and origin/destination surveys were conducted at the Kingston/Bedford Garage, Lincoln/Essex lot, and the Lafayette Place Garage in April, 1988. Key findings from these surveys are summarized in Table IV A-7.

Table IV A-6

Study Area Off-Street Parking Supply: 1988

MAP NO.	LOCATION	TYPE	USE	Capacity 1988	Day Rate 1988
1	Winthrop Square Garage	Garage	Public	1,125	4.40
2	Lafayette Place Garage	Garage	Public	1,050	13.00
3	99 Summer Street	Garage	Private	70	
4	75-101 Federal Street	Garage	Private	140	
5	Kingston/Bedford Garage	Garage	Public	550	9.50
6	150 Federal Street	Garage	Private	365	19.00
7	84-96 Beach Street	Garage	Public	350	10.00
8	100 Federal Street	Garage	Private	197	0.00
9	Keystone Building	Garage	Private	163	0.00
10	Lincoln/Essex Lot	Lot	Public	130	13.00
11	203-213 Essex Street	Lot	Public	83	11.00
12	564-580 Washington St.	Lot	Public	64	11.00
13	128-130 Essex Street	Lot	Public	51	12.00
14	3-5 Ping On Street	Lot	Public	28	12.00
15	Purchase Street Lot	Lot	Private	24	0.00
16	Purchase Street Garage	Garage	Private	20	0.00
17	One Financial Center	Garage	Private	260	
18	130 Kingston Street	Lot	Public	18	12.00
20	22 Edinboro Street	Lot	Public	15	12.00
21	101 Arch Street	Garage	Private	27	14.00
22	Shoppers' Garage	Garage	Public	500	9.25
23	17-21 Tyler Street	Lot	Public	65	
24	73-75 South Street	Lot	Private	12	
	Total			5,424	
	Public			4,336	80%
	Private			1,088	20%
	Garage			4,887	90%
	Lot			537	10%



HOWARD/STEIN-HUDSON ASSOCIATES

EXISTING CONDITIONS (1988)
PARKING SUPPLY

KEY: —— PARKING STUDY AREA BOUNDARY

GARAGE   LOT

N

Figure IV A-8

Table IV A-7

Kingston/Bedford Garage Field Surveys: April, 1988
Summary of Parking Facility Characteristics

Feature:	Kingston/Bedford Garage	Lincoln/Essex Lot	Lafayette Place Garage
Capacity	550	130	1050
All Day Rate	$9.50	$13	$13
Total Daily Parkers	468	272	1363
Peak Traffic Hour:			
Enter:	8:30-9:30 a.m.	8:30-9:30 a.m.	8:30-9:30 a.m.
Exit:	5:45-6:45 p.m.	5:15-6:15 p.m.	4:30-5:30 p.m.
Peak Traffic Volume:			
Enter:	149	51	273
Exit:	108	34	229
Peak Accumulation:			
Hours:	11:45,12:00,1:15 2:15	12:00-1:00	12:30-1:30
Peak Occupancy:	354	127	860
% Capacity	48.2	96.9	81.9
Parking Duration:	8-9 hrs: 17.0% 9-10 hrs: 14.6% 10+ hrs: 11.7% 2-3 hrs: 10.3%	1-2 hours: 19.1% 0-1 hrs: 15.9% 2-3 hrs: 15.5%	10+ hrs: 16.3% 1-2 hrs. 15.1% 2-3 hrs: 11.2% 8-9 hrs: 9.4%
Average Duration:	6.39 hours	4.06 hours	6.28 hours
Parking Turnover:			
Based on full capacity	0.6	2.1	1.3
Based on peak occupancy	1.3	2.1	1.6
Parker Trip Purpose:	Work: 81%	Work: 53% Sales/Business: 32% Personal: 10%	Work: 54% Sales/Business:19% Shopping: 14%
Av. Walk Distance:	891 feet	828 feet	804 feet
Primary Destination (CTPS Zone)*	10C: 34%	10C: 34%	8B: 36%

* See Figure IV A-16

As shown, the existing Kingston/Bedford Garage is primarily a commuter garage, with 81% of the parkers using the garage for work trips, and an average parking duration in excess of 6 hours. About half the parkers at the Lincoln/Essex lot are workers and 32% in town for sales/business purposes. Average duration here is somewhat shorter at about four hours. About half the parkers at the Lafayette Place Garage are also workers, 19% in town for sales/business, and 14% for shopping. The primary destination of parkers at the Kingston/Bedford Garage and the Lincoln/Essex lot was CTPS zone 10C, including such large office buildings as 100 Summer Street and the Shawmut Bank Building. At Lafayette Place, not surprisingly, the primary destination was Zone 8C, in which the garage is located. Average walking distance of parkers to their destination was 800-900 feet, with parkers at the Kingston/Bedford Garage (the lowest priced of the three) travelling the longest distance.

3. Traffic Assumptions for Impact Analysis

To compare the transportation impacts of the No Build option and the five development options, the standard steps of the transportation planning process; i.e, trip generation, mode split, trip distribution, and network assignment -- were applied to the development parameters for each option, as discussed below.

Trip Generation Rates. Basic to a determination of development project transportation impacts is the estimation of the trips which the project will generate in various time periods of interest, and for various travel modes. In the case of the Kingston-Bedford-Essex proposed development, besides looking at the trips generated during an average weekday and in the AM and PM hours of peak travel, the MEPA scope for environmental documentation also asks that trip-making for the Saturday peak hour be included.

As a basis for trip generation in this report, the Institute of Transportation Engineers (ITE) "Trip Generation" Manual was used. It is one of the major references used in the estimation of trip generation which presents trip generation rates for a wide variety of land uses based on surveys of actual developments located at various sites across the country. It is also the only major reference which deals directly with Saturday trip-making, a requirement for this report. Another feature of the Manual is that for many land uses, notably office and shopping, trip rates are adjusted according to the size of the development, as found in survey work.

The rates in the Manual deal with vehicle trips only, and in dominantly suburban settings where transit service is negligible. There is also no overt consideration of car occupancy as a variable factor, nor any division between journey to/from work and other trips. In order to apply these rates to central Boston where transit and walk-in trips play substantial access roles, the Manual vehicle trip rates had to be converted to person trip rates. The person trips had to be then broken down into the various travel modes (automobile, transit, walking) and work/non-work categories. Vehicle trips were obtained by dividing auto person trips by appropriate car occupancy factors.

In this report, person trips were obtained from the ITE vehicle rates by conversion factors related to ITE probable car occupancies and an allowance for some nominal transit and walk access. The resultant person trip rates for each activity and time period were also compared for compatibility with person trip rates used in other Boston transportation analyses. Trip estimation had to be done by land use for each development option considered.

The Boston trip generation sources referred to were Central Transportation Planning Staff (CTPS) interim trip generation rates related to the Central Artery project, the Draft Access Plan Guidelines of the Boston Transportation Department (BTD), and a number of EIR's for previous Downtown Boston developments. These were referenced for consistency checks and used for the estimation of the division between work and non-work trips. The person trip rates adopted are presented in Appendix T5 for each land use by analysis period, divided into work and non-work categories. (It may be noted that a "work" trip includes only the journeys to or from the place of employment. "Additional" trips made by employees, even on business, would be considered "non-work")

In order to give a somewhat more detailed record of the actual basis for the rates adopted, the person trip generation rates for each land use are discussed below. It should be noted that the size of the office land use component is by far the largest, so that office trip rates have the greatest impact on the total trip generation of all options.

<u>Office Person Trip Rates</u> - The ITE Manual notes that the average car occupancy for office trips is 1.2 persons. The Manual vehicle rates per 1000 SF for General Office (Land Use Code 710) were multiplied by this 1.2 factor and further augmented by 10% to allow for nominal transit and walk-in access which is low or non-existent in the Manual. This resulted in a 1.32 times conversion factor, with weekday person trips rates around 12 arrivals and departures, compared to a CTPS interim rate of 13.4. The Kingston-Bedford-Essex rates are a little lower because the CTPS rate is constant and intended to represent an average development, which is smaller than any Kingston-Bedford build alternative. The conversion factor used would be equivalent to the CTPS rate at an office development size of about 300,000 SF.

The ITE rates vary according to the size of the office development, with larger developments having lower trip <u>rates</u> per 1000 SF. This is related in part to the fact that larger office buildings have fewer employees per unit area and that more non-work trips are satisfied on site. As the Manual recommends, the rates were calculated by using the equations given for the different time periods considered. For calculation of the proportion of work and non-work trips, total person trips were divided in accordance with the interim CTPS work/non-work proportions for the corresponding time period.

<u>Retail Person Trip Rates</u> - In a manner generally similar to the estimation of office rates, the ITE Manual retail (Shopping Center, Land Use Code 820) vehicle rates per 1000 SF were factored to produce person trips. The rates were not, however, varied according to the precise size of the retail component of each development option. This is because the Manual rates apply to free-standing retail developments in suburban locations, where

few, if any other retail shops are within walking distance. In the case of Kingston-Bedford-Essex, the relatively small ground floor retail development can not be seen in isolation from the 1 million plus square feet of Downtown retail within easy walking distance, and so must be put in the context of a major shopping area. The ITE rates used for all development alternatives were therefore calculated at a level of 1,000,000 square feet.

A factor of 1.7, representative of the car occupancy of retail customers, was used to convert vehicle trips for the time periods considered to person trips. The resultant weekday person arrivals and departures is about 57, compared to a CTPS interim retail rate of about 60, and a BTD Draft Access Plan Guidelines general retail rate of about 37 person "trip ends". The various time period rates were divided into work and non-work components according to the corresponding retail proportions in the CTPS/BTD rates.

Hotel Person Trip Rates - ITE Manual vehicle trip rates per room for hotels (ITE Land Use Code 310) for the various time periods were converted into person trips by a factor of 2.0, which was chosen to calibrate to the common CTPS and BTD weekday person rate of just over 17 person arrivals and departures per room. Work and non-work components were derived by the proportions of such trips in the corresponding time periods of the CTPS/BTD rates, as with the other land use trips.

Modal Split and Car Occupancy Calculations. As stated above, the determination of total person trip generation is followed by the assignment of the person trips for each land use to the appropriate mode of transportation; i.e., automobile, transit, or walk/other (taxi, bike, etc.). For the vehicle trips, auto person trips are converted to auto trips by vehicle occupancy factors, i.e., the number of persons per car for each type of trip.

Mode split and vehicle occupancy tend to vary between different land uses due to the specific trip making characteristics related to each. The distinction between various mode split and vehicle occupancy factors also applies to the type of trip being made, most commonly divided into work and non-work trips. For example, the mode split for hotel workers is similar to that for office workers or retail workers, but hotel guests will have very different patterns both from the hotel workers and from office visitors or retail customers. Mode split and vehicle occupancy is also heavily influenced by the location of the particular development, especially in terms of vehicular and transit accessibility and parking availability and price.

Table IV A-8 presents the mode split and vehicle occupancy trip making characteristics by land use for work and non-work trips to the development site as a fairly typical Downtown Boston location. These mode split and vehicle occupancy factors are

derived from several sources in order to achieve factors appropriate for the Kingston-Bedford-Essex location and consistent with assumptions used in other studies for nearby projects.

Table IV A-8

Trip Making Characteristics by Land Use To Downtown Boston[1]

	Percentage Share			
Land Use	Auto	Vehicle Occupancy	Transit	Walk/ Other
Office				
Work	30%	1.8	60%	10%
Non-work	27.5%	1.4	47.5%	25%
Retail				
Work	30%	1.4	60%	10%
Non-work	27.5%	1.9	32.5%	40%
Hotel				
Work	30%	1.4	60%	10%
Non-work	55%	1.9	20%	25%

Specific points of interest about the sources and rates used in the above table are presented below by land use category.

Office and Retail - The primary source for the modal split and car occupancy rates for the office work and non-work trips was the Environmental Impact Assessment for 125 High Street prepared by HMM Associates and Vanasse/Hangen/Brustlin Associates in 1986. These rates were based primarily upon actual building surveys conducted by Cambridge Systematics, Inc., reported on in their 1983 report: Parking in Central Boston. One change was made to the rates, namely the reduction of the work trip transit share from 70% to 60% to allow for 10% walk trips. This shift was judged appropriate due to the increase in downtown and central neighborhood housing supply, and other surveys which indicate that many central neighborhood residents walk to work.

---

1. Source: Cambridge Systematics, Parking in Downtown Boston, 1983.
Vanasse/Hangen/Brustlin, 125 High Street EIA, 1986, PBQD and Norman Abend, Copley Place EIR, 1978, Howard/Stein-Hudson Associates field surveys.

Hotel - For hotel work trips, the 125 High Street EIA was used. For non-work trips, rates used in the Copley Place EIR (1978) conducted by Parsons Brinckerhoff and Norman Abend, which were based upon surveys of hotels, were used, adapted for the differences between the Back Bay and Downtown location.

Kingston-Bedford-Essex Development Trips. The trip generation rates and associated parameters described in the preceding sections were applied to each development alternative by individual land use to yield project-generated person trips by mode. These are set forth in Table IV A-9 and are depicted in a number of bar charts in a comparative fashion in Figure IV A-9.

As shown in Table IV A-9 and Figure IV A-9, total weekday person trips by land use range from around 10,000 trips per day for the 250' Tower to 14,000 trips per day for the 400' Tower. The 325' Tower, the Expanded Site, and the Developer's Proposal generate from 12,000 - 13,000 person trips per day. The distribution of trips by use varies for each option. The hotel use generates from 1/4 to 1/3 the total daily trips for the 400' Tower, the 325' Tower, the 250' Tower, and the Expanded Site. For the Developer's Proposal, which does not include a hotel, the primary trip generator is the office use.

The land use mix also affects the extent and nature of peak hour tripmaking. In the AM peak hour, the 400' Tower and the Developer's Proposal each generate around 1,800 person trips in and out, with the other three varying from 1,200 to 1,500 person trips. For all uses, the office use is the primary generator. In the PM peak hour, the Developer's Proposal generates about 1,900 trips in and out, and the 400' Tower, 1,800. The 325' Tower, the 250' Tower and the Expanded Site again range from 1,200 to 1,500 person trips. Again, office use is the primary generator; however in the PM peak hour, there are obviously more retail trips than in the AM peak hour, which occurs before stores are open.

Table IV A-10 and Figure IV A-10 show the comparative vehicular trip generation of each build alternative. In terms of total weekday vehicle trips, the options range from around 2,100 vehicles/day for the 250' Tower and the Developer's Proposal to nearly 3,000/day for the 400' Tower and the Expanded Site, with the 325' Tower at 2,500 vehicles/day. In the morning peak hour, the options range from around 250 vehicles/hour in and out for the four others. In the PM peak, the options are within 100 cars, with the 250' Tower the lowest at 200 cars/hour, and the others between 250-300 cars/hour.

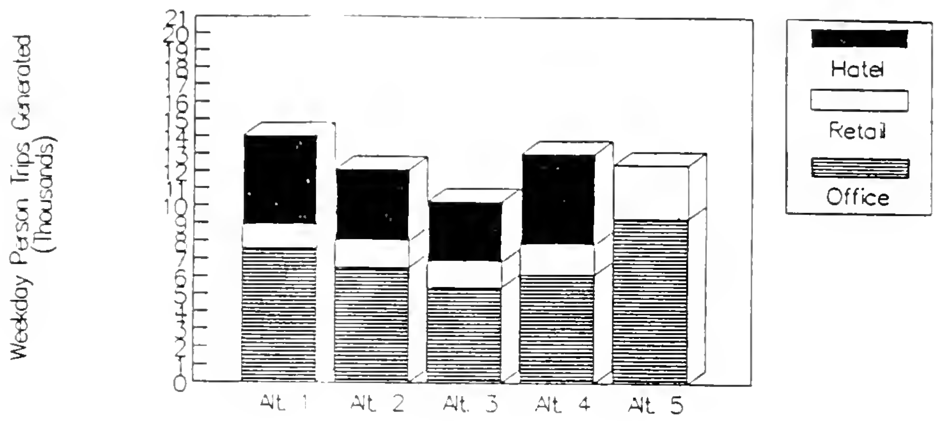
Table IV A-9
Person Trip Summary by Alternative

	Alternative				
	400' Tower	325' Tower	250' Tower	Expanded Site	Developer's Proposal
TOTAL ADT:					
Work	5,874	5,043	4,196	4,972	6,443
Non-Work	8,158	7,079	6,081	8,042	5,976
Total	14,032	12,122	10,277	13,014	12,419
AM PEAK					
In					
Work	995	835	671	792	1,241
Non-Work	479	371	294	433	321
Total In:	1,474	1,206	965	1,225	1,562
Out					
Work	0	0	0	0	0
Non-work	320	253	199	284	242
Total Out:	320	253	199	284	242
Total					
Work	995	835	671	792	1,241
Non-work	799	624	493	717	563
Total	1,794	1,459	1,164	1,509	1,804
PM PEAK					
In					
Work	85	73	59	70	114
Non-work	388	316	263	369	272
Total In	473	389	322	439	386
Out					
Work	937	794	644	750	1,171
Non-work	372	310	263	354	320
Total Out	1,309	1,104	907	1,104	1,491
Total					
Work	1,022	867	703	820	1,285
Non-work	760	626	526	723	592
Total	1,782	1,493	1,229	1,543	1,877
SATURDAY TOTAL					
Work	2,194	1,890	1,579	1,937	2,276
Non-Work	4,827	4,491	4,089	5,289	3,549
Total	7,021	6,381	5,668	7,226	5,825
SATURDAY PEAK					
In					
Work	72	65	55	66	89
Non-work	248	242	228	271	180
Total In	320	307	283	337	269
Out					
Work	77	69	63	68	80
Non-work	197	195	185	219	173
Total Out	274	264	248	287	253
Total					
Work	149	134	118	134	169
Non-work	445	437	413	490	353
Total	594	571	531	624	522

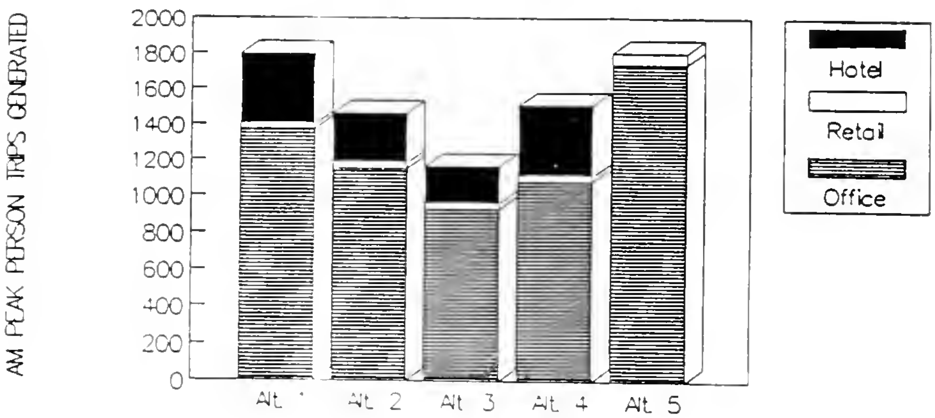
PERSON TRIP GENERATION BY LAND USE

KINGSTON/BEDFORD DEVEL. ALTERNATIVES

WEEKDAY PERSON TRIPS BY LAND USE



AM PEAK HOUR PERSON TRIPS BY LAND USE



PM PEAK HOUR PERSON TRIPS BY LAND USE

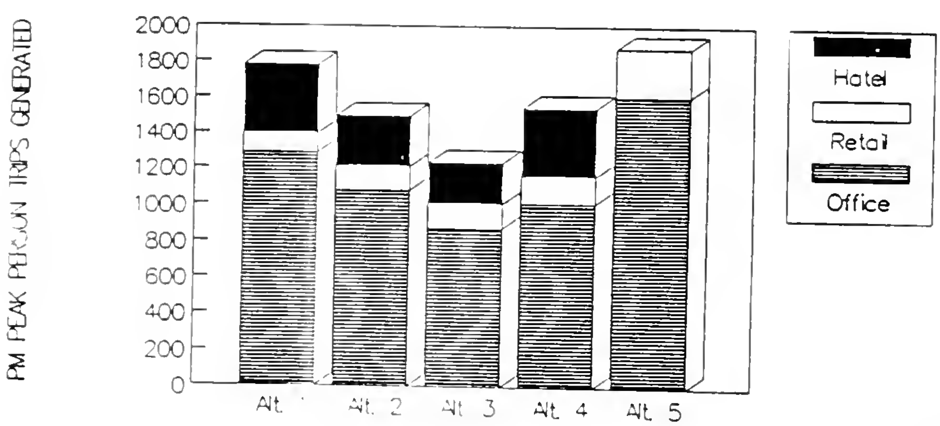
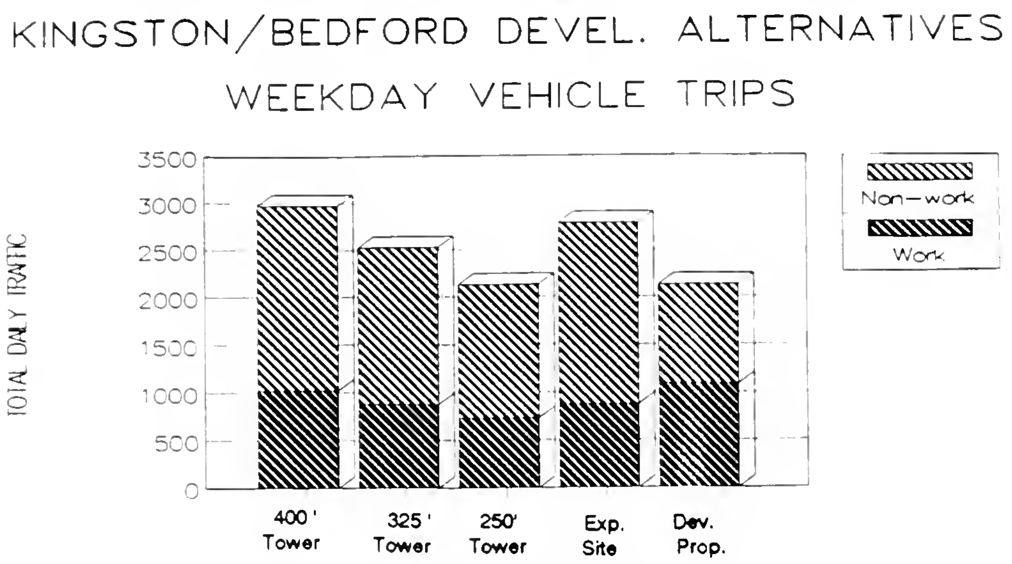


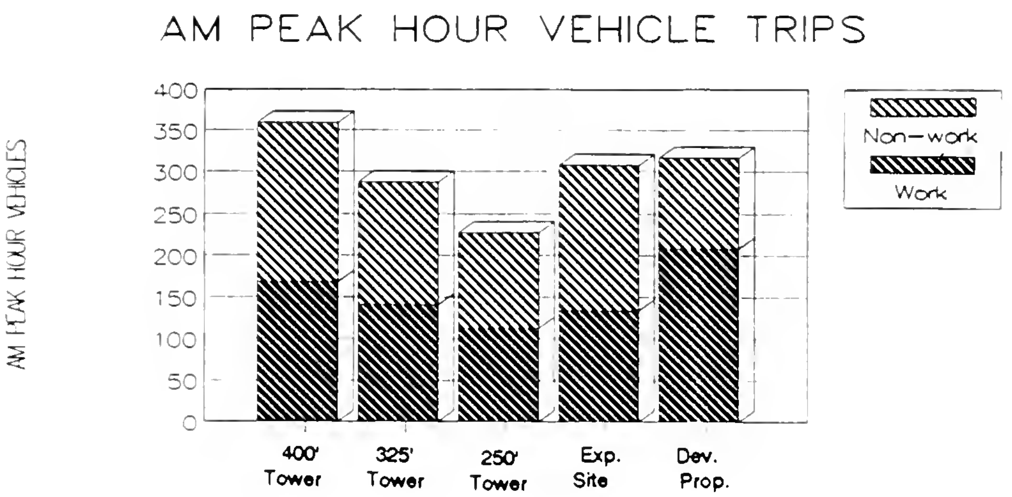
Figure IV A-9

Table IV A-10
Vehicle Trip Summary by Alternative

	Alternative				
	400' Tower	325' Tower	250' Tower	Expanded Site	Developer's Proposal
TOTAL ADT:					
Work	1,023	878	732	875	1,091
Non-Work	1,954	1,648	1,396	1,910	1,034
Total	2,977	2,526	2,128	2,785	2,125
AM PEAK					
In					
Work	168	141	113	134	208
Non-Work	116	88	69	106	62
Total In:	284	229	182	240	270
Out					
Work	0	0	0	0	0
Non-work	75	58	45	68	47
Total Out:	75	58	45	68	47
Total					
Work	168	141	113	134	208
Non-work	191	146	114	174	109
Total	359	287	227	308	317
PM PEAK					
In					
Work	15	13	10	12	20
Non-work	94	74	61	89	48
Total In	109	87	71	101	68
Out					
Work	157	133	108	126	197
Non-work	86	69	58	81	57
Total Out	243	202	166	207	254
Total					
Work	172	146	118	138	217
Non-work	180	143	119	170	105
Total	352	289	237	308	322
SATURDAY TOTAL					
Work	402	349	294	363	401
Non-Work	1,186	1,055	941	1,251	524
Total	1,588	1,404	1,235	1,614	925
SATURDAY PEAK					
In					
Work	12	11	9	11	15
Non-work	61	58	54	64	27
Total In	73	69	63	75	42
Out					
Work	14	12	11	12	14
Non-work	47	44	42	50	26
Total Out	61	56	53	62	40
Total					
Work	26	23	20	23	29
Non-work	108	102	96	114	53
Total	134	125	116	137	82

VEHICLE TRIP GENERATION BY ALTERNATIVE





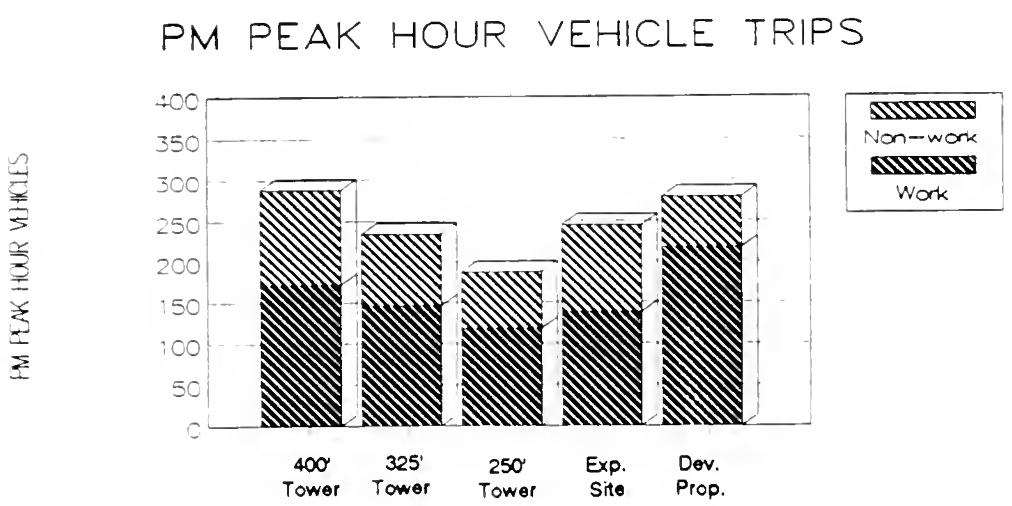


Figure IV A-10

Vehicular Trip Distribution. The future project traffic volumes for impact analyses of Kingston-Bedford-Essex alternatives at key intersections were estimated by distributing the vehicle trips generated into the directions of origin/destination, and assigning this directional division of trips to the actual roadways serving the development. Such assigned volumes when added to the existing and background growth traffic form the future traffic volume input for calculation of Levels-of-Service (LOS).

The basis for the regional trip distribution proportions was the origin/destination information gathered from current surveys[2] of parking at the Kingston-Bedford-Essex site as well as at Lafayette Place. The origin-destination from this survey shows the following general pattern of vehicular travel to the project area, with some rounding of the percentages:

General Area	Percent of Trips
North	20
South	30
West	30
Boston Urban Core	20

	100%

For estimation purposes, the trips to and from the urban core, including and immediately surrounding the Downtown area, have been designated "local" in nature. The compass direction area trips outside of the core area are considered "regional". For the local trips, an even directional distribution into the four compass directions is assumed (5% for each), including east, which represents South Boston across the Fort Point Channel. Regional trips are divided according to the survey proportions, omitting east, which in the regional sense is Massachusetts Bay. This division of trips by direction is shown in Table IV A-11, below.

To assign the distribution to the actual street network serving the project, judgments were made on what proportions of local and regional trips would travel on specific streets, as shown in Table IV A-12. Trips to the site and from the site are differentiated in the table.

----

2. Howard/Stein-Hudson Associates, Kingston/Bedford Garage: Parking Demand and Traffic Impact Analyses, Boston Real Property Department, 1988.

Table IV A-11

Directional Distribution of Kingston-Bedford-Essex Vehicle Trips

Compass Direction	Local Area Component	Regional Component
North	5 %	20 %
South	5	30
East	5	--
West	5	30
	------	------
	20 %	80 %

Table IV A-12

Proportional Assignment of Kingston-Bedford-Essex
Project Trips to Key Streets

To the Site:	Local Trips				Regional Trips				Rounded Distribution (Percent of Trips)
	N	S	E	W	N	S	E	W	
Essex St. EB	.4	.4	-	.5	.1	.1	-	.2	17
Kneeland/Surf.Art.	-	.3	-	.5	-	-	-	.1	7
Summer/Bedford	.6	-	1.0	-	.9	-	-	-	26
Atlantic/Essex WB	-	-	-	-	-	-	-	.7	21
Lincoln St.	-	.3	-	-	-	.9	-	-	29

									100

From the Site:	Local Trips				Regional Trips				Rounded Distribution (Percent of Trips)
	N	S	E	W	N	S	E	W	
Lafayette/Tremont	.2	.2	-	.4	.1	-		.2	12
Lafayette/Harrison	-	.3	-	.3	-	.1	-	-	6
Surf.Art./Kneeland	-	.3	-	.3	-	-	-	.1	6
Lincoln/Summer	.8	-	1.0	-	.1	-	-	-	11
Kingston/Essex EB:									
- turning to south	-	.2	-	-	-	.9	-	.7	49
- turning to north	-	-	-	-	.8	-	-	-	16

									100

The resultant percentage distribution in the above tables show a strong connection to streets leading directly to/from the Central Artery and Massachusetts Turnpike, and a lesser use of

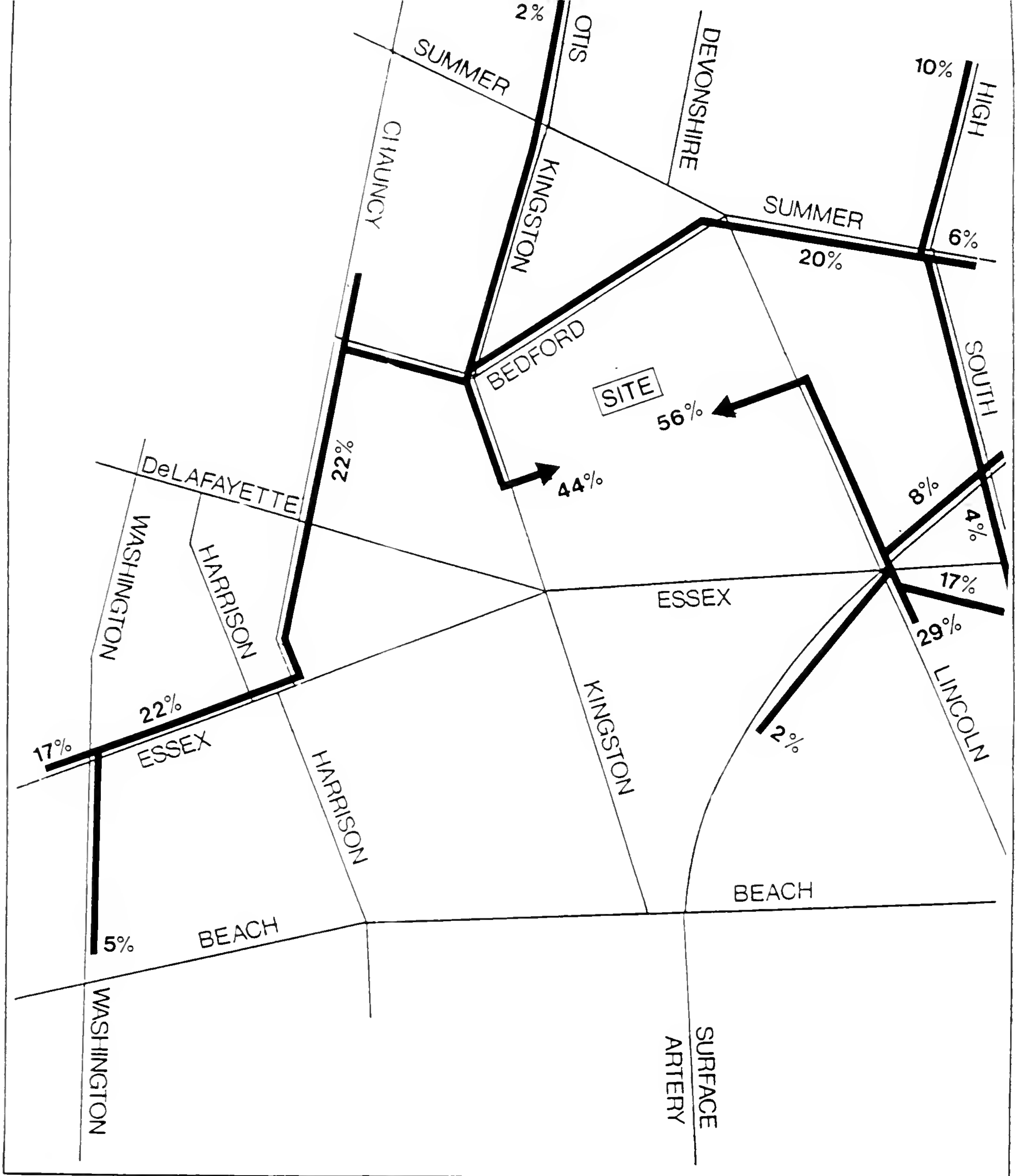
purely local streets. A finer-grained distribution is very sensitive to the array of street directions available in the site area, such as on Essex Street and Kingston Street, and to the location of garage entrances and exits. As currently proposed, the garage design calls for an entrance and exit onto Kingston Street, and a reversible driveway at Lincoln Street, which would operate as an entrance in the morning and an exit in the evening. The resulting detailed assignments to study area intersections are shown by percentages in Figures IV A-11 and IV A-12 for entering and exiting traffic.

Public Transportation Trip Distribution. Public transportation trips for the No Build alternative and the five build alternatives were distributed to the various transit modes serving the site on the basis of the relative proportion of total Boston Proper trips carried by each of the public transportation modes. This breakdown is shown in Table IV A-13 and Figure IV A-13. As shown, rapid transit carries about 63% of total weekday peak hour public transportation trips in and out of Boston Proper, according to the 1982 Boston Proper Cordon Count conducted by the City of Boston Transportation Department. Streetcar (Green Line) carries about 18%; commuter rail, 9%; express and local buses, 9.7%; and commuter boat 0.3%. The cordon count showed that in the AM peak hour, public transportation carries about 58,000 persons into Boston Proper, and in the PM peak hour, public transportation carries about 67,000 persons out of Boston Proper.

To these figures were then applied more detailed MBTA ridership estimates which showed the proportion of peak hour riders for each line in each direction. The resulting share, as shown in Figure IV A-14, was then used as the basis for estimating no-build and build alternative transit impacts. Summaries of peak hour riders by line for each alternative are included in Section 4 of this chapter.

Pedestrian Trip Distribution. Pedestrian trip distribution was based on an analysis of relative boardings at the transit stations within walking distance of the site, and to and from the Downtown Crossing shopping district and Chinatown. It is anticipated that entrances and exits will be provided for the Kingston-Bedford-Essex development at five locations, as shown in Figure IV A-15. These are described below, along with the expected daily percentage of pedestrians projected to use each.

- A principal entrance at the Kingston/Bedford corner is expected to accommodate about 52% of total daily pedestrian trips because it is the most convenient

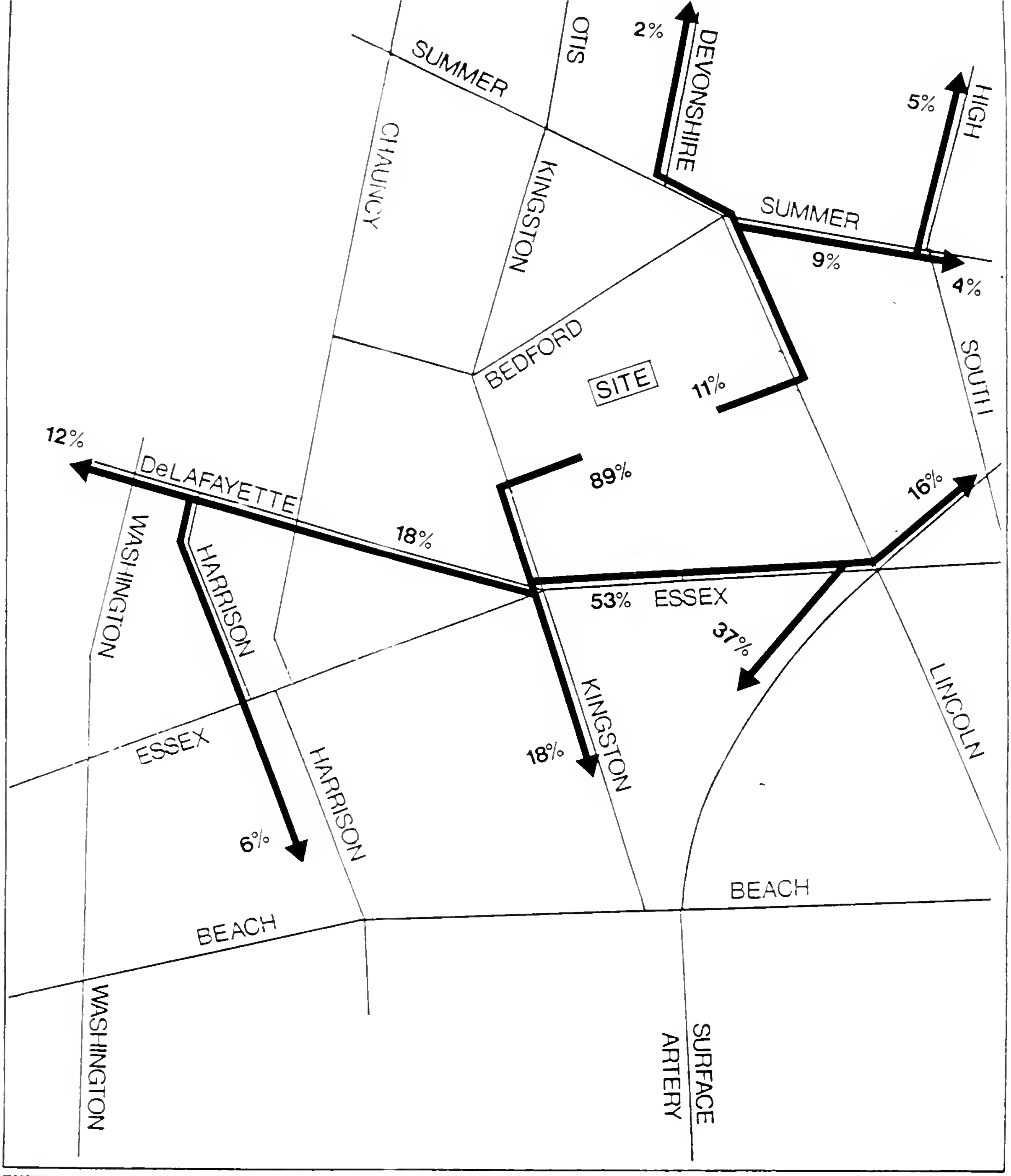


HOWARD/STEIN-HUDSON ASSOCIATES

PERCENTAGE DISTRIBUTION OF SITE GENERATED TRAFFIC: ENTERING

N

Figure IV A-11



HOWARD/ STEIN- HUDSON. ASSOCIATES

PERCENTAGE DISTRIBUTION OF SITE GENERATED TRAFFIC: EXITING

N

Figure IV A-12

Table IV A-13

Derivation of Public Transportation Trip Assignment for Project and Background Development Trips

Line/Direction	Est. Weekday Trips (Inbound)	Percent of Mode	Percent of Total
Red/North	56,550	26.0%	16.4%
Red/South	60,400	27.6%	17.5%
Blue/North	35,950	16.5%	10.4%
Orange/North	27,550	12.7%	8.0%
Orange/South	37,050	17.0%	10.8%
Total Transit	217,500		63.0%
Green/West	71,414	88.4%	15.9%
Green/East	9,405	11.5%	2.0%
Total Streetcar	80,819		18.0%
Commuter Rail No.	14,078	44.4%	4.0%
Commuter Rail So.	17,643	55.6%	5.0%
Total Commuter Rail	31,721		9.0%
Turnpike Ex. Buses	4,600	18.1%	1.8%
Other Buses	20,862	81.9%	7.9%
Total Bus	25,462		9.7%
Commuter Boat	1,903		0.3%
Total	712,907		100.0%

Source: MBTA "Ridership and Service Statistics," Operations Directorate, Planning Division, October, 1988 (compiled from individual tables and figures within the text)

Boston Proper Cordon Count, City of Boston, 1982

Figure IV A-13

PERCENTAGE SHARE OF DOWNTOWN TRANSIT TRIPS BY MODE

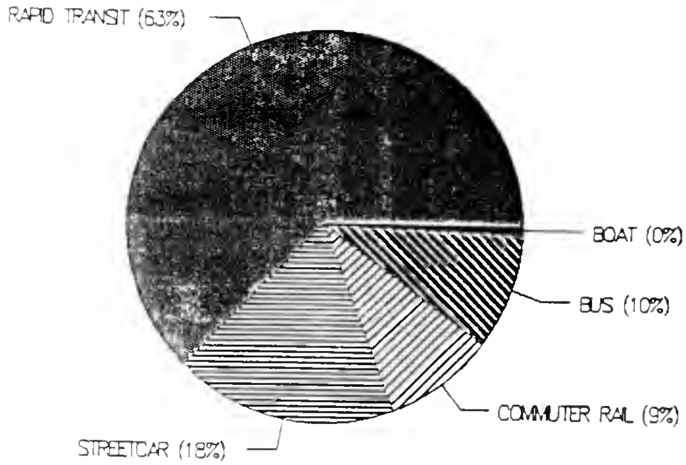
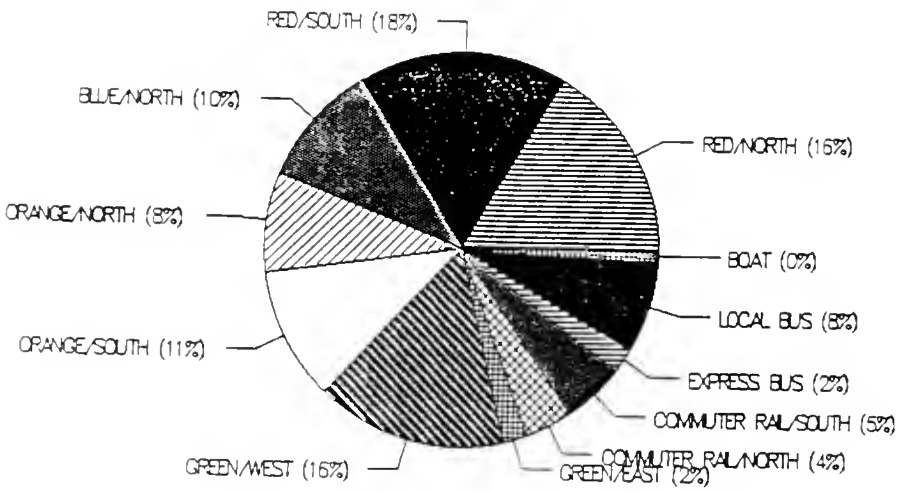


Figure IV A-14

PERCENT OF MBTA PEAK HOUR RIDERS BY LINE AND DIRECTION



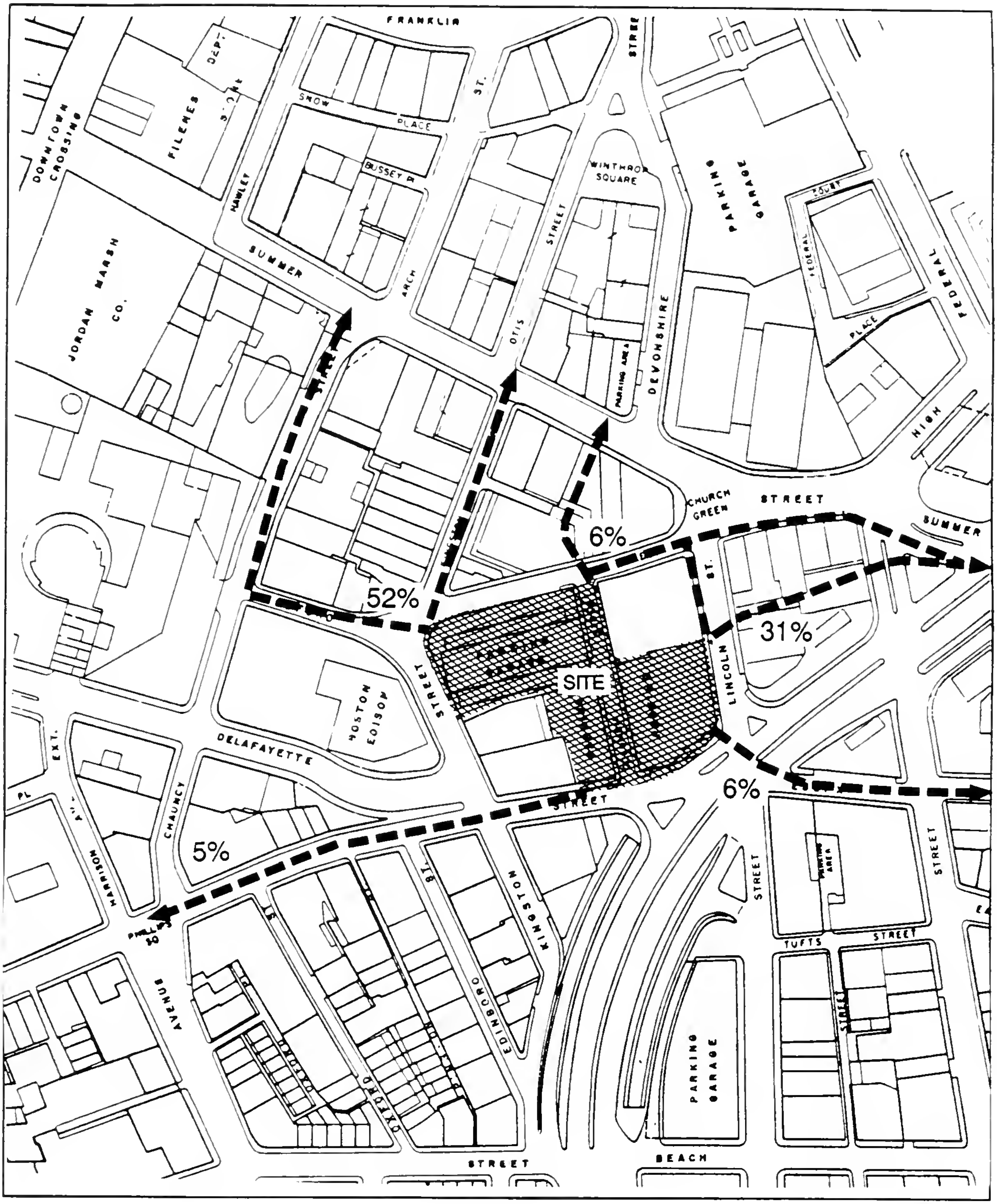
entrance for access both to the Downtown Crossing shopping district and to the Downtown Crossing MBTA station.

- Two entrances are provided on Lincoln Street -- one at the corner of Lincoln and Essex Street, and another midblock on Lincoln Street between Essex and Summer Streets. It is possible that this entrance will connect to an enclosed arcade through the Kingston-Bedford-Essex project to a similar arcade through 125 Summer Street. Retail uses can be located along the arcade in each building. It is estimated that the Lincoln Street arcade entrance would be the primary route to and from the site and South Station, especially in the winter months, because, even though it is not controlled by a signal, its route to South Station is much more direct, and it is weather protected. This entrance is thus projected to account for 35% of the peak hour transit commuter trips. Overall, this entrance is estimated to account for about 31% of total daily pedestrian trips, and the Lincoln/Essex entrance, which is a primary link to Chinatown and the Leather District, about 6% of total daily pedestrian trips.

- An arcade connection can also be provided midblock on Bedford Street between Lincoln and Kingston to connect to the entrance to 99 Summer Street. It is estimated that this entrance will also account for about 6% of total daily pedestrian trips.

- A fifth entrance is to be provided near the corner of Essex and Kingston Street. This is the primary entrance serving the Chinatown and Boylston (Orange and Green Line) MBTA stations. It is estimated that this entrance will serve about 5% of transit commuter trips, and 10% of total daily pedestrian trips.

Summaries of pedestrian trip distribution for each build alternative are included in Section 4.



HOWARD/ STEIN- HUDSON. ASSOCIATES	PEDESTRIAN TRIP DISTRIBUTION	N Figure IV A-15

4. Probable Impacts of the Alternatives

The analysis of project related traffic impacts requires the assessment of future study area traffic volumes and circulation patterns for the 1993 analysis year. Existing traffic plus non-project traffic additions in the analysis year form a "no-build" baseline traffic condition against which the project generated traffic impacts are to be assessed. The expected street circulation patterns, and their associated diversions of future traffic, also form a part of the estimation of background traffic growth.

Development through the 1993 analysis year, both within and adjacent to the study area, was identified by the BRA. Two types of development were identified in terms of traffic impacts. First, those projects which would directly affect study area intersections by adding both local and regional trips, such as Lafayette Place and Commonwealth Center -- were identified. Then, projects sufficiently distant from the Kingston-Bedford-Essex project that the regional component of vehicle trip generation would not directly influence traffic conditions at study area analysis locations were identified. For example, the regional traffic component of trips generated by the International Place and 125 High Street developments are expected to exit the regional highway network at locations north of the study area. Local traffic generated by these developments, however, may impact intersections adjacent to the Kingston-Bedford-Essex project.

The estimation of future year traffic levels was therefore assessed through carrying out the following steps:

1) First, the effects of new street circulation patterns on traffic at study area locations were identified.

2) Development scheduled for completion between 1988 and the design year (1993), as identified by BRA, was then obtained, and classified into direct impact projects and "background" impact projects as described above.

3) Then, in order to establish growth factors for the "background" projects, downtown floor space totals by zone and land use were summarized from 1986 Central Transportation Planning Staff (CTPS) data. This year was chosen as the base year because it was the most recent year for which comprehensive data by zone were available. Projects completed between 1986 and 1988 were added to the 1986 totals to obtain a 1988 base condition.

4) Vehicular trip generation was then estimated for both types of projects.

5) For the direct impact trips, specific percentage distribution of traffic on routes to and from each project for local and regional traffic was identified. The total vehicle trips were then assigned to intersections based on these percentages, and finally added to study area intersection turning movement volumes.

6) Finally, the "background" traffic growth was estimated according to the percentage increase in floor space over existing conditions which is represented by the additional development. The resulting percentage increase was then applied to the intersection traffic volumes which resulted from the two steps above to obtain the No Build volumes.

Each of the steps is is described in more detail in the sections below.

Study Area Proposals for Roadway Network Changes. The study area street system has been in a state of continual change to accommodate the needs of new developments in surrounding areas, to carry out long standing plans for downtown circulation, and, in the shorter term, to provide for ongoing construction activity. Long-term changes must be understood and taken into account in order to predict accurately and in a coordinated way the impacts of the Kingston-Bedford-Essex and other proposed downtown projects; and the shorter term changes must be understood in interpreting traffic count data. An underlying concern is also the short and long term impacts of the Central Artery/Third Harbor Crossing project, both in terms of construction and "post-build" conditions.

For the 1993 analysis year, the following roadway network assumptions have been incorporated in the assessment of future traffic volume levels:

- o Beach Street closed at the Chinatown Gate (Kingston Street and Edinboro Street open to Surface Artery);
- o Avenue de Lafayette closed between Washington Street and Harrison Avenue Extension; and
- o Hayward Street and Avery Street reversed (one-way westbound).

In addition, the implications of providing for a two-way widened Essex Street between South Street and Kingston Street was also examined. This long standing improvement along the Essex Street corridor that provides for the development of Essex Street as an east-west artery into the downtown area greatly improves regional access to Downtown Crossing and also serves as a relief to traffic along Summer Street, Bedford Street, Beach Street and

Kneeland Street which currently act as the only westbound distributors to the area. When Summer Street was closed west of Chauncy/Arch Street, as part of the Downtown Crossing auto-restricted zone, westbound distribution within the downtown was shifted to more circuitous routes. Today, a proposed closure of Beach Street to through traffic to aid in the unification of the Leather District and Chinatown would further restrict westbound traffic flow.

The following summarizes the components of the ongoing widened two-way Essex Street proposal:

- Reconstruction of 500 feet of Essex Street between Atlantic Avenue and the Surface Artery as a two-way roadway with two continuous travel lanes in each direction and curb service lanes where possible has been completed in coordination with the construction of One Financial Center on the north side of Essex Street in this block.

- Provision of revised signalization at the intersection of Essex Street with the Surface Artery.

- Acquisition and removal of two five-story brick buildings at the northeast corner of the Essex/Kingston intersection.

- Reconstruction of 350 feet of Essex Street between the Surface Artery and Kingston Street as a two-way roadway with two travel lanes and a curb service lane in the westbound direction and with two through travel lanes and a right turn lane in the eastbound direction.

Although the ramp locations for the Central Artery/Third Harbor Tunnel project were unknown at the time of this traffic operations analysis, current planning efforts provide for a reversing the direction of the Lincoln Street Central Artery ramps from a northbound off-ramp to a southbound on-ramp, and making the Surface Artery one-way southbound in the area. These changes would have implications for study area intersections, especially those along the Essex Street and Surface Artery corridors, which are generally addressed in the sections below, but are beyond the scope of the detailed analysis at this time.

The design year for the Kingston-Bedford-Essex project (1993) will occur one year prior to commencement of Central Artery construction, according to the present schedule. The scheduled completion date for the southbound section of the Central Artery is 1996.

Future Direct Impact and Background Impact Development Traffic. Proposed development through the 1993 analysis year both within and adjacent to the study area, as identified by BRA, is presented in Table IV A-14 and depicted in Figure IV A-16. The existing (1988) traffic volume levels include the developments in Table IV A-14 scheduled for completion in 1988 (101 Arch Street, 99 Summer Street, 150 Federal Street and 75-101 Federal Street). The projects were then classified into direct impact projects and "background" impact projects.

Developments identified to have direct traffic impacts include; 125 Summer Street, Commonwealth Center (Phase I); Boston Crossing (Phase I and II) and other developments in CTPS Zones 8b, 10c, and 28,. (It should be noted that Commonwealth Center Phase II and Boston Crossing Phase III are significant developments which will directly effect study area intersections; however, both projects are scheduled for completion beyond the analysis year in 1995.) The remaining developments are included in the "background" impact category.

Then, total development floor area by land use for the study area was summarized for the base year (1986) using CTPS data classified into zones (North Downtown - zones 1, 3, 12 & 13a and South Downtown - zones 8b & c, 9a & b, 10a, b, c, & d, 11a, b & c, 14b & 28). Known development occurring between 1986 and 1988 as obtained from BRA was added to the 1986 totals to produce existing conditions land use data which would correspond to the 1988 traffic count data. Then, the identified 1988-1993 development was added to the 1988 totals to produce the design year "no build" floor space totals for direct impact and "background" impact development.

Table IV A-15 presents an estimate of the total development area by land use within the downtown area for 1986, 1988 and 1993.

Table IV A-15

Downtown Area Development Floor Space Totals

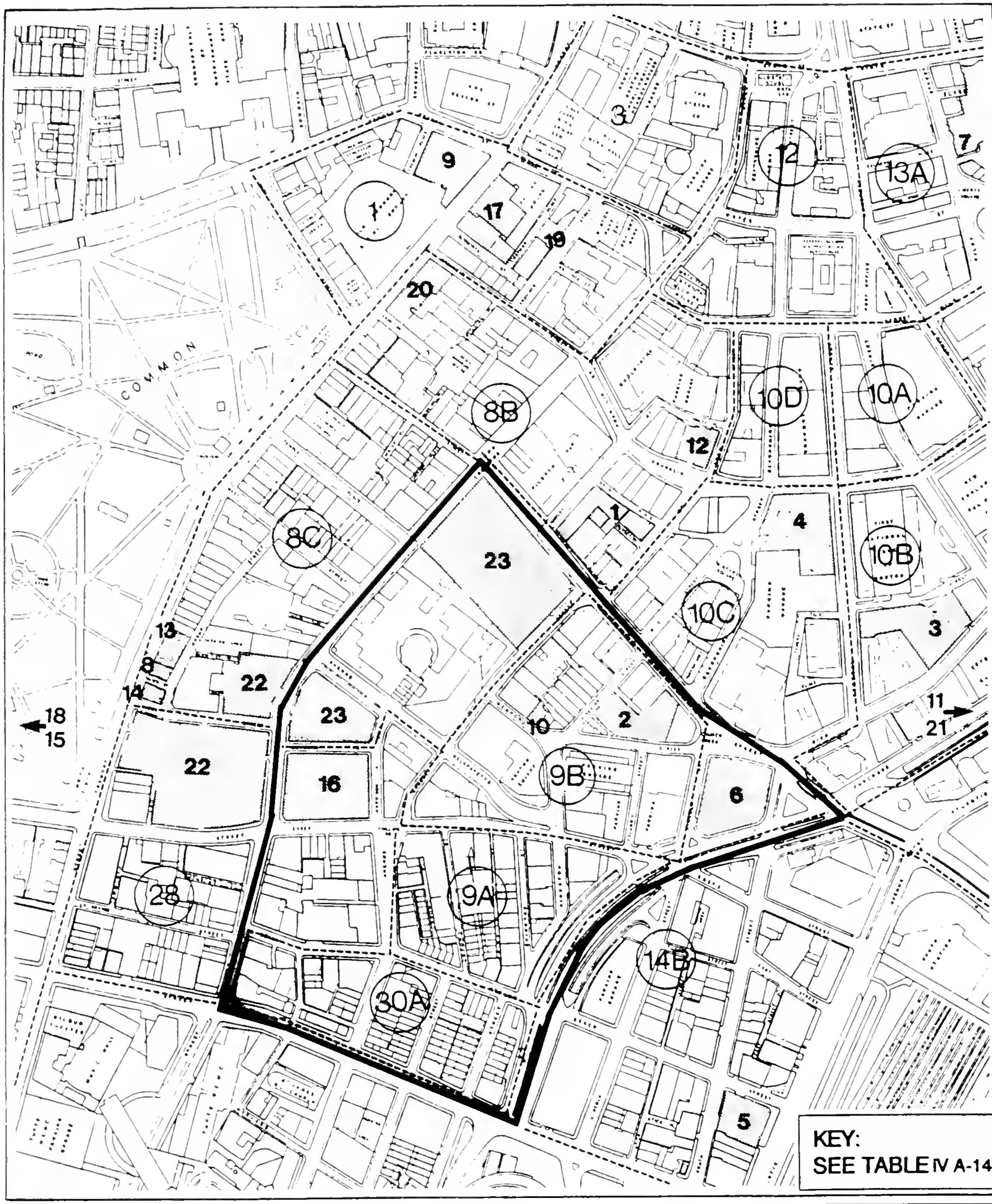
	Office	Retail	Medical	Eductn	Cult/Rec	Indust	Hotel	Residtl	Total
Total 1986	26,663,080	4,136,310	60,630	5,850	264,834	2,186,608	751,300	1,544,066	35,630,807
Add'l 1986-88	1,670,000	85,000	0	0	0	0	0	0	1,755,000
Total 1988	28,333,080	4,221,310	60,630	5,850	264,834	2,186,608	751,300	1,544,066	37,385,807
Add'l 1988-1993	5,648,400	917,700	0	0	35,000	0	225,000	268,000	7,094,100
Direct Impact	1,751,000	773,700	0	0	35,000	0	225,000	268,000	3,052,700
General Impact	3,897,400	144,000	0	0	0	0	0	0	4,041,400
Total 1993	33,981,480	5,139,010	60,630	5,850	299,834	2,186,608	976,300	1,812,066	44,479,907

Table IV A-14
Development Projects Included in No Build Traffic Assignments

CTPS Zone	Year	Project	Map No.	Office (sq ft)	Retail (sq ft)	Resident (d.u.)	Hotel (rooms)	Cult/Rec (sq ft)	Parking Spaces
8C	1988	101 Arch Street	1	353,000	40,000				27
9B	1988	99 Summer Street	2	240,000	20,000				70
10B	1988	150 Federal Street	3	527,000	10,000				263
10C	1988	75-101 Federal Street	4	550,000	15,000				140
1	1989	73 Tremont Street	9	264,000	13,000				74
8B	1989	Parkside West	8		2,400	93			94
10C	1989	125 Summer Street	6	447,000	17,000				300
13A	1989	75 State Street	7	693,000	22,000				700
14B	1989	745 Atlantic Ave.	5	158,000	6,000				153
8B	1990	Parkside at Mason	14		2,300	52			10
8B	1990	Parkside East	13		3,000	123			161
8C	1990	64-74 Franklin Street	12	79,400	9,000				
9B	1990	80 Bedford Street	10	39,000	3,000				
11B	1990	125 High Street - I	11	894,000	19,000				850
28	1990	600 Washington Street	16						
31	1990	146 Boylston Street	15		18,300	41			
1	1991	45 Province Street	19	126,500	12,000				402
1	1991	Tremont Temple	17	188,500	4,000				100
8C	1991	110-120 Tremont Street	20	426,000	6,000				275
11B	1991	125 High Street - II	11	438,000	9,000				
11B	1991	International Place - II	21	570,000	30,000				397
29A	1991	Pavilion at Park Sq.	18	75,000	25,000				200
8B	1992	Commonwealth Center - I	22					35,000	
8B	1992	Boston Crossing - I	23		520,000				est 800
28	1992	Commonwealth Center - I	22	775,000	240,000		300		800
8B	1993	Boston Crossing - II	23	550,000					
		TOTAL		7,393,400	1,046,000	309	300	35,000	

<u>Downtown Area Additional:</u>

CTPS Zone	Year	Project	Map No.	Office (sq ft)	Retail (sq ft)	Resident (d.u.)	Hotel (rooms)	Cult/Rec (sq ft)	Parking Spaces
8B	1995	Boston Crossing - III	24	850,000					
28	1995	Commonwealth Center - II	23	575,000	25,000			25,000	400
		Subtotal		1,425,000	25,000	0	0	25,000	
		Grand Total		8,818,400	1,071,000	309	300	60,000	



HOWARD/STEIN-HUDSON ASSOCIATES

DESIGN YEAR (1993)
BACKGROUND DEVELOPMENT

(9B) =CTPS zones

N

Figure IV A-16

Table IV A-16 presents a summary of the relative increases in development by land use within the analysis zones. Total developed square footage within the area increased by approximately 4.9 percent between 1986 and 1988. According to BRA sources, total developed floor area in the analysis zones is expected to increase an additional 19 percent by the 1993 analysis year.

Table IV A-16

Relative Increases In Downtown Area Development

	Office	Retail	Medical	Eductn	Cult/Rec	Indust	Hotel	Residtl	Total
Total % increase:									
1986-88	6.3%	2.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.9%
% increase 1988-93									
Total	19.9%	21.7%	0.0%	0.0%	13.2%	0.0%	29.9%	17.4%	19.0%
Direct Impact	6.2%	18.3%	0.0%	0.0%	13.2%	0.0%	29.9%	17.4%	8.2%
Background Impact	13.8%	3.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	10.8%
Direct % of Total:	31.0%	84.3%	na	na	100.0%	na	100.0%	100.0%	43.0%
Backgrnd % of Total:	69.0%	15.7%	na	na	0.0%	na	0.0%	0.0%	57.0%

During the 1988 - 1993 period the BRA estimates that total office space within the study area will increase by 19.9 percent and retail space by 21.7 percent. Hotel, cultural/recreational and residential development is expected to increase in the area by 29.9, 13.2 and 17.4 percent, respectively. Direct impact developments account for approximately 43 percent of the total identified development within in the analysis zones. The direct impact development accounts for 100% of additional hotel, cultural/recreational and residential development. Approximately 84.3% of all retail development and 31% percent of office development are expected to directly impact study intersection locations.

Table IV A-17 identifies the expected number of person trips to the downtown area within the identified CTPS zones. These estimates are approximated using CTPS trip generation rates by land use. The relative increases in vehicle trips to the downtown study area are identified in Table IV A-18. The overall increase in vehicle trips to the area during the 1986 to 1988 period is approximately 4.1 percent, with the largest increase due to office development. Vehicle trips within the study area are expected to increase by 20.2 percent between 1988 and the 1993

Table IV A-17
Estimated Person Trips For Downtown Area Development

	Office	Retail	Medical	Eductn	Cult/Rec	Indust	Hotel	Residtl	Total
Total 1986 Trips	178,643	124,917	600	77	6,806	4,811	6,536	12,507	334,896
Total 1988 Trips	189,832	127,484	600	77	6,806	4,811	6,536	12,507	348,652
Direct Impact 1988-93	11,732	23,366	0	0	900	0	1,958	2,171	40,125
Bckgrnd Impact 1988-93	26,113	4,349	0	0	0	0	0	0	30,462
Total Add'l 1988-93	37,845	27,715	0	0	900	0	1,958	2,171	70,587
Total 1993 Trips	227,676	155,198	600	77	7,706	4,811	8,494	14,678	419,239

Table IV A-18
Relative Increases in Estimated Vehicle Trips to Downtown Area Development

	Office	Retail	Medical	Eductn	Cult/Rec	Indust	Hotel	Residtl	Total
% Increase 1986-88									
Total	6.3%	2.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.1%
Direct Impact	6.2%	18.3%	0.0%	0.0%	13.2%	0.0%	29.9%	17.4%	11.5%
Bkgnd Impact	13.8%	3.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	8.7%
% Increase 1988-93									
Total	19.9%	21.7%	0.0%	0.0%	13.2%	0.0%	29.9%	17.4%	20.2%

analysis year. Direct impact vehicle trips account for an 11.5 percent increase over existing 1988 traffic volume levels. Other development within the study area is expected to contribute an 8.7 percent background increase to existing traffic levels.

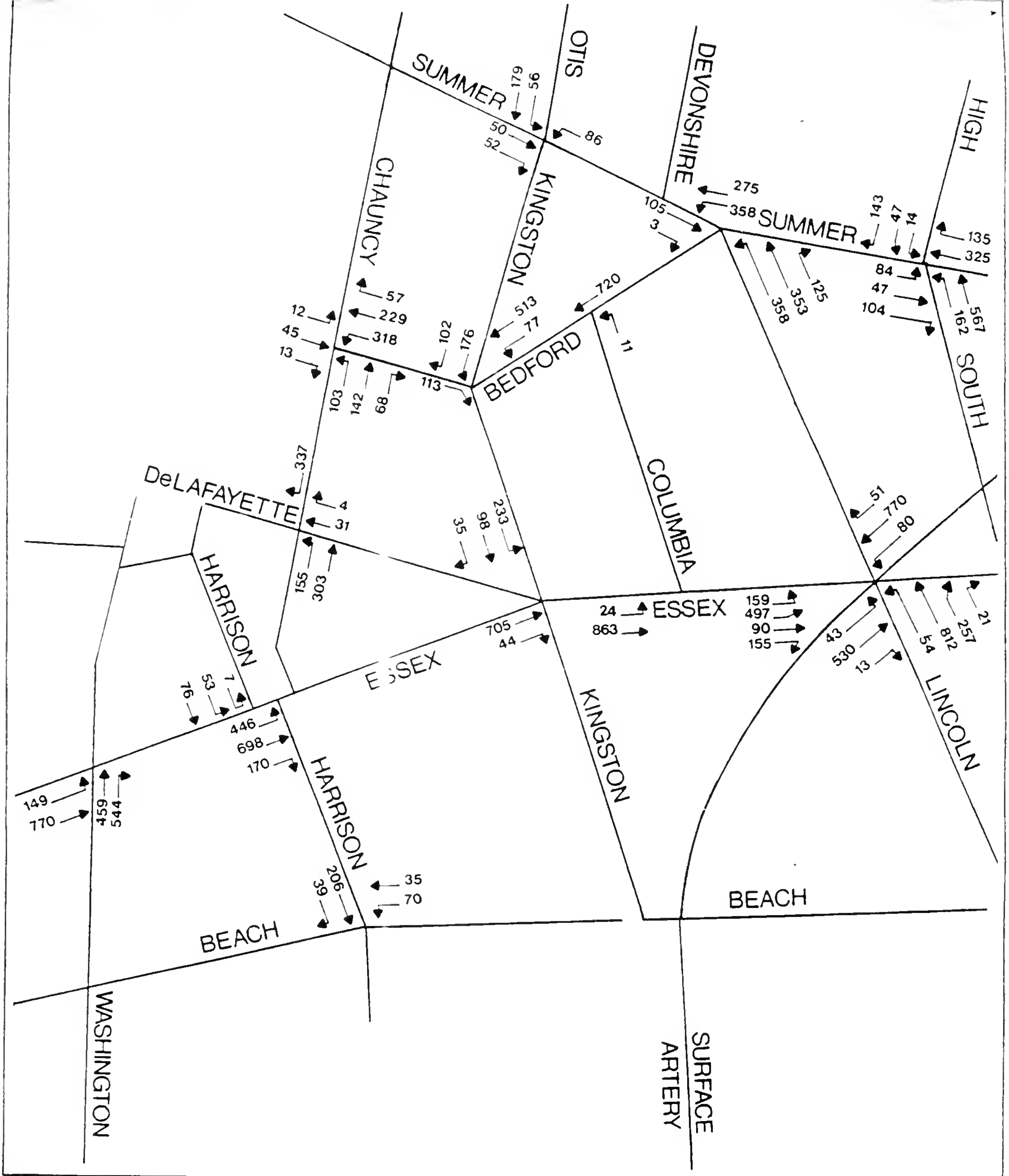
The resulting No Build traffic volume levels for morning, evening and Saturday peak hour periods are presented in Figures IV A-17, IV A-18 and IV A-19, respectively.

Traffic Impacts. Due to the fact that the traffic generation of all five build alternatives is not significantly different (see below), analyses are presented only for the alternative that produces the highest trip generation as a worst case (400' Tower). All the intermediate build alternatives have traffic impacts between those of the No Build and the highest trip generator, the 400' Tower. As will be seen, the incremental differences do not warrant showing a multiplicity of intermediate analysis results.

In the previous sections on trip generation, it can be seen that the greatest difference in directional peak hour traffic between the lowest and highest build alternatives amounts to 102 vehicles in the morning peak hour, 77 vehicles in the evening peak hour and 31 vehicles during the Saturday peak hour. This volume disperses quickly into several directions and may be able to utilize more than one lane at various intersection approaches on its routings. It takes approximately 150 vehicles per hour per lane in the critical turning movements of an intersection to cause one full Level of Service change. The range of traffic differences between the build alternatives must be seen in this light.

As an overview to the relative contributions of existing, No Build (other project and background traffic growth), and project generated traffic (400' Tower) to the traffic volumes, the total approach volumes at some key intersections for the PM peak hour are shown in Figure IV A-20 as a bar chart broken down into the three components. Although this exhibit does not differentiate between different intersection movements which vary as to number of lanes and whether a given movement is critical, the relative volume contribution to the total approach traffic is a reasonable indicator of the relative impact of each volume source. It can be seen in most cases that the No Build traffic is far greater than project traffic and that both of these are moderately small in reference to the existing traffic.

Traffic impacts for the No Build alternative and the 400' Tower were analyzed for two roadway network options along Essex Street. The first reflects the existing configuration of Essex

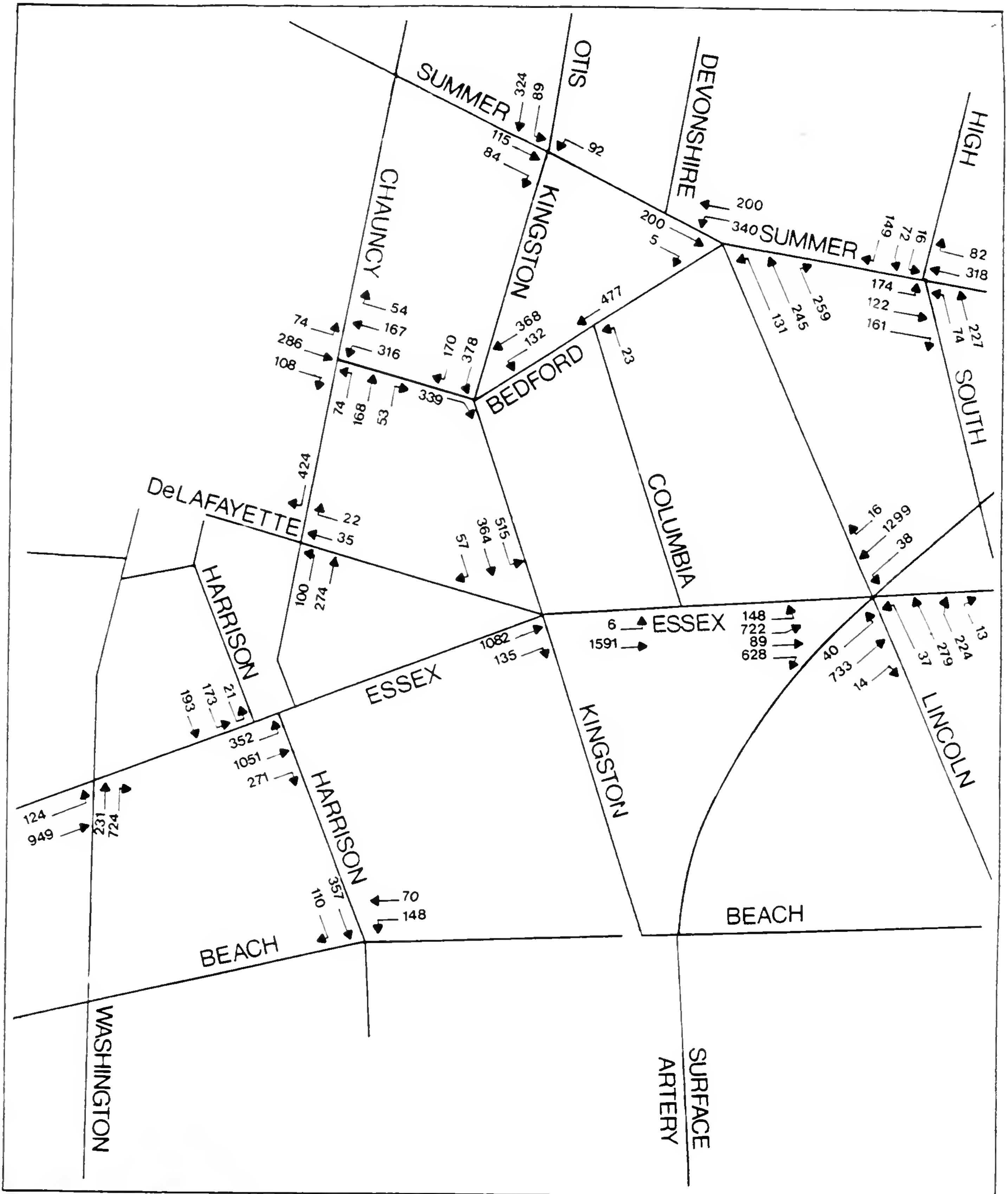


HOWARD/STEIN-HUDSON ASSOCIATES

NO BUILD (1993) CONDITIONS - AM PEAK HOUR TRAFFIC VOLUMES
(existing Essex Street configuration)

N

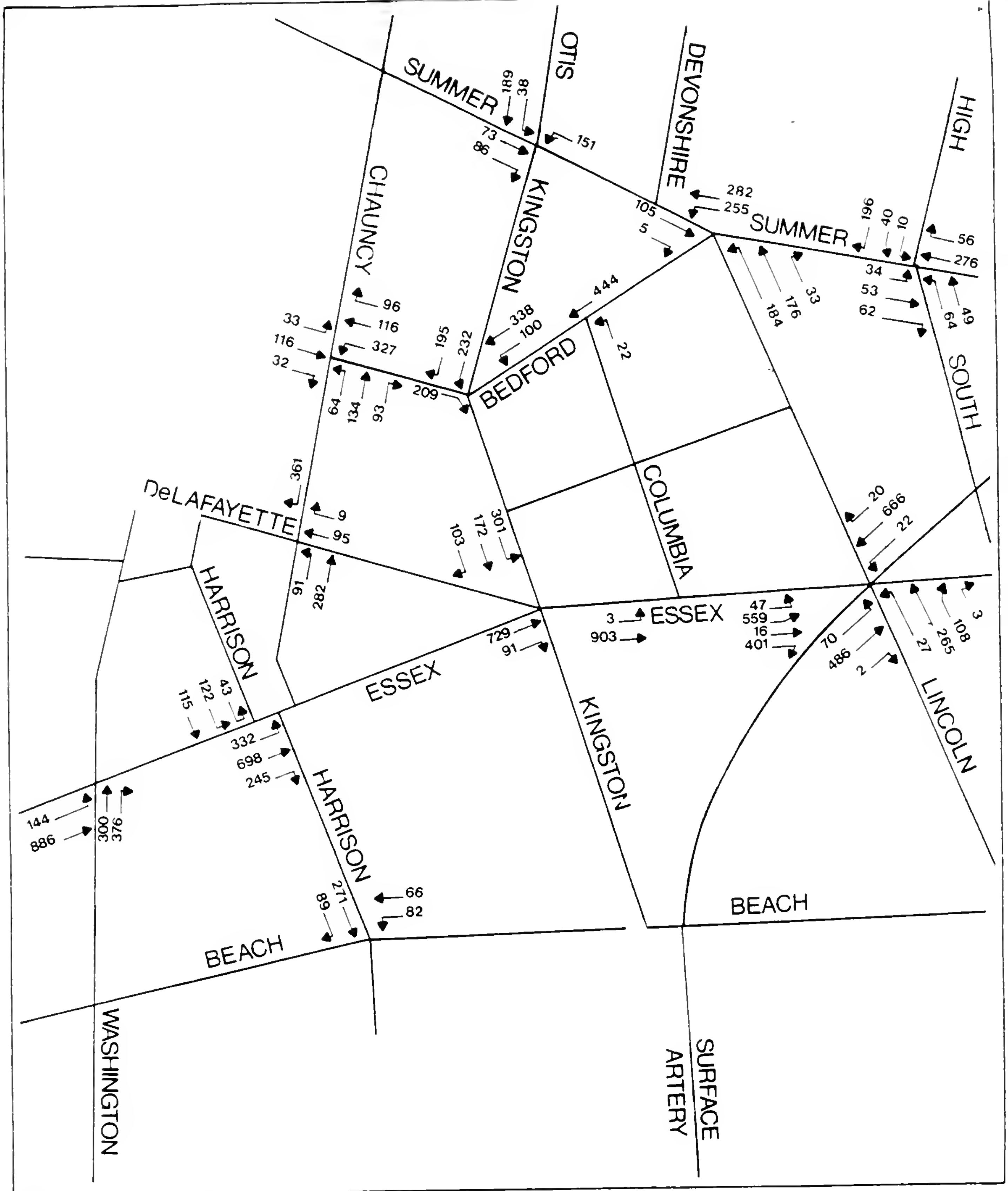
Figure IV A-17



NO BUILD (1993) CONDITIONS - PM PEAK HOUR TRAFFIC VOLUMES
(existing Essex Street configuration)

N

Figure IV A-18



HOWARD/STEIN-HUDSON ASSOCIATES

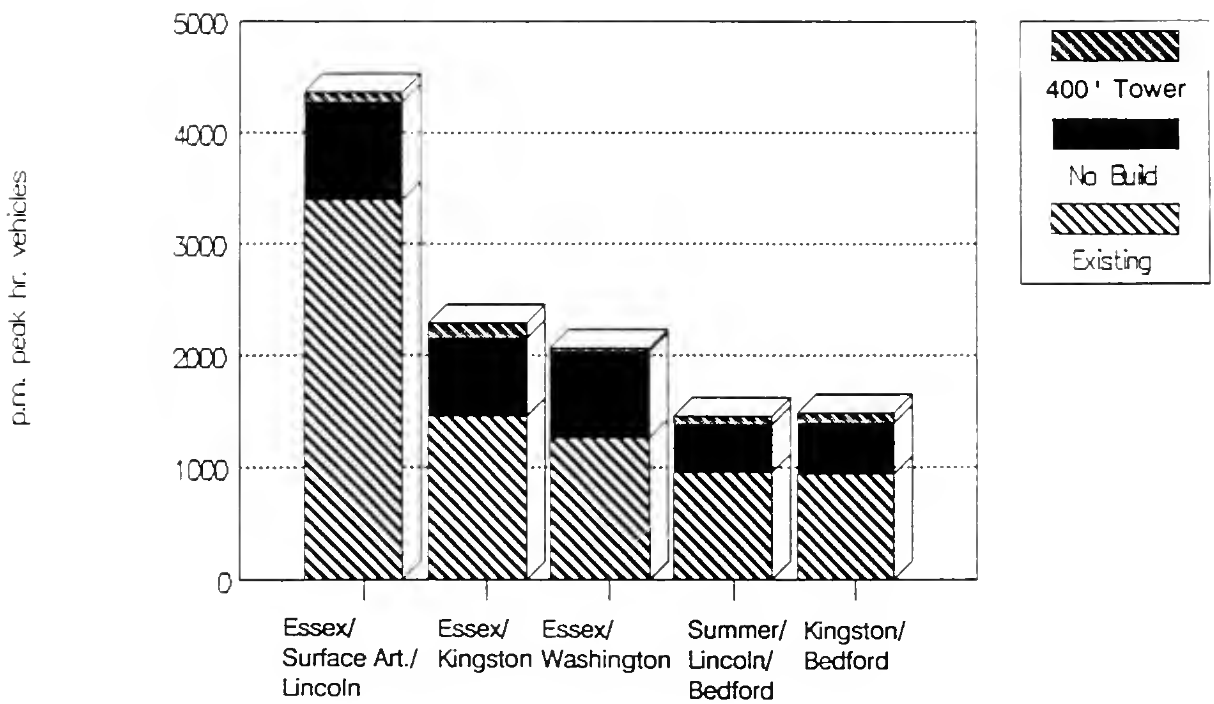
NO BUILD (1993) CONDITIONS - SAT. PEAK HOUR TRAFFIC VOLUMES
(existing Essex Street configuration)

N

Figure IV A-19

Figure IV A-20

Kingston/Bedford: Incremental Traffic Volumes



Street as a one-way eastbound segment between Kingston Street and South Street. The second assumes a widened, two-way Essex Street along this same segment.

No Build Traffic Impacts: Existing Essex Street Configuration. Table IV A-19 presents the expected traffic operations for No Build (1993) conditions, assuming the existing Essex Street configuration. The No Build assignment assumes the completion of Phase I and II of the Boston Crossing project and Phase I of the Commonwealth Center development. These two major projects rely heavily on Bedford Street and Washington Street for access during the morning peak hour periods. During the evening peak hour period, exiting traffic produces significant pressures along and across the Essex Street corridor.

During the morning peak hour, deficient traffic operations are limited to the unsignalized intersection locations of:

- Bedford/Chauncy/Lafayette Place Garage (LOS F); and
- Essex/ Harrison/Chauncy (LOS E).

In addition, the Essex/Kingston/Ave. de Lafayette intersection operates at LOS D during the morning peak hour period.

During the evening peak hour, unacceptable traffic operating conditions are evident at the unsignalized intersections of:

- Bedford/Kingston (LOS F); and
- Essex/Kingston/Ave. de Lafayette (LOS F).

During the evening peak, unacceptable conditions are also present at the two intersections which operate poorly in the morning; i.e.:

- Bedford/Chauncy/Lafayette Place Garage (LOS F); and
- Essex/Harrison/Chauncy (LOS F).

In addition, unacceptable traffic operating conditions are evident at the signalized intersections of:

- Essex/Surface Artery/Lincoln (LOS F); and
- Essex/Washington (LOS E).

The Summer/Lincoln/Bedford intersection approaches unacceptable operating conditions during the evening peak hour period (LOS D).

Table IV A-19

No Build (1993) Conditions - Traffic Operations Summary
(existing Essex Street configuration)

SIGNALIZED INTERSECTIONS

Intersection Location	AM PEAK HOUR LOS	AM PEAK HOUR Average Delay	PM PEAK HOUR LOS	PM PEAK HOUR Average Delay	SAT PEAK HOUR LOS	SAT PEAK HOUR Average Delay
Summer/High/South	B	12.51	B	7.44	B	7.75
Summer/Lincoln/Bedford	B	11.81	D	29.23	B	9.76
Summer/Otis/Kingston	B	6.84	B	7.11	B	7.17
Essex/Surface Artery/Lincoln	C	17.14	F	74.12	D	34.67
Essex/Washington	B	12.74	E	57.31	B	10.13

UNSIGNALIZED INTERSECTIONS

Intersection Location	AM PEAK HOUR LOS	AM PEAK HOUR Reserve Capacity	PM PEAK HOUR LOS	PM PEAK HOUR Reserve Capacity	SAT PEAK HOUR LOS	SAT PEAK HOUR Reserve Capacity
Bedford/Columbia						
Columbia NB	C	275	A	537	A	465
Bedford/Kingston						
Kingston SB	D	163	F	0	E	92
Bedford/Chauncy/LP Garage						
LaFayette Ent. EB	A	580	D	198	A	510
Bedford WB	F	0	F	0	F	0
Essex/Kingston/Ave. de Lafayette						
Kingston SB						
LT	D	118	F	0	E	17
TH	B	343	F	0	C	234
Essex/Harrison/Chauncy						
Harrison SB						
LT	E	18	F	0	F	0
TH	E	23	F	0	F	0
Harrison/Beach						
Beach WB	A	625	C	239	B	395

The same unsignalized intersections that operate poorly during the evening peak hour also exhibit unacceptable LOS during the Saturday peak hour period, namely:

- Bedford/Kingston (LOS E);
- Bedford/Chauncy/Lafayette Place Garage (LOS F);
- Essex/Kingston/ Ave. de Lafayette (LOS E); and
- Essex/Harrison/Chauncy (LOS F).

The signalized intersection of Essex/Surface Artery/Lincoln approaches unacceptable operating conditions during the Saturday peak hour period (LOS D).

No Build Traffic Impacts with Mitigation. The degradation of traffic operations at study area intersection intersections for No Build Conditions is assumed to be mitigated by other development projects, or by the City. The results of expected mitigation measures of No Build traffic impacts to improving traffic operations at signalized study area intersections are presented in Table IV A-20.

As shown in the table, traffic operations can be improved to acceptable levels at the Essex/Surface Artery/Lincoln intersection through channelization within the existing right-of-way along the Essex Street approach (reserved right turn lane from Kingston Street to Surface Artery) and signal rephasing to facilitate right turns.

Traffic operations during the evening peak hour period at the Essex/Washington intersection can be improved to almost acceptable levels (LOS E, close to D) with the installation of pavement markings designating eastbound lane movements (left turn/through, through, through) and through the institution and enforcement of peak hour parking restrictions along the eastern Essex Street section between Washington Street and the Surface Artery.

Signalization is the assumed mitigation measure for the unsignalized intersections that operate poorly under No Build Conditions. For the poorly operating unsigalized locations, signalization brings operating conditions to acceptable levels during all peak hour periods, as shown in Table IV A-21.

Table IV A-20

No Build (1993) Conditions - Traffic Operations Summary
at Signalized Intersections
With Improvements by Others
(existing Essex Street configuration)

	SIGNALIZED INTERSECTIONS					
	AM PEAK HOUR		PM PEAK HOUR		SAT PEAK HOUR	
Intersection Location	LOS	Average Delay	LOS	Average Delay	LOS	Average Delay
Bedford/Kingston	B	8.39	B	12.34	B	10.06
Bedford/Chauncy/LP Garage	C	16.00	D	25.24	B	14.18
Essex/Surface Artery/Lincoln	D	26.24	D	30.40	C	17.25
Essex/Kingston/DeLafayette	B	7.03	B	9.75	B	7.86
Essex/Harrison/Chauncy	A	3.77	B	6.29	B	7.49
Essex/Washington	na	--	E	41.55	na	--

Table IV A-21

No Build (1993) Conditions - Traffic Operations Summary
With Improvements by Others
for Unsignalized Intersections
(existing Essex Street configuration)

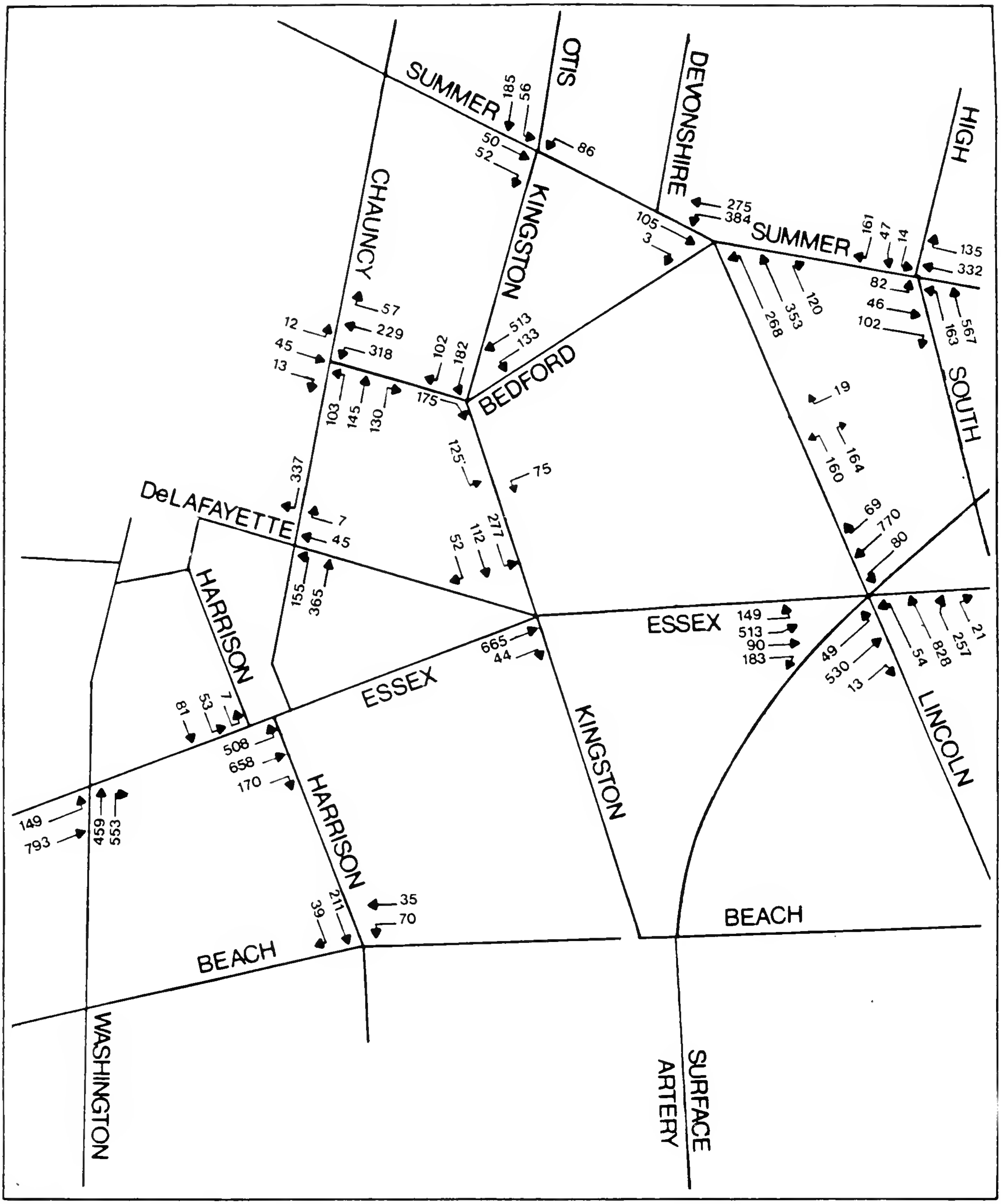
	LOS by Time Period		
Unsignalized Intersection	AM Peak	PM Peak	Sat. Peak
Bedford/Kingston	B	B	B
Bedford/Chauncy/Laf. Pl. Gar)	C	D	B
Essex/Kingston/Ave. de Lafayette	B	B	B
Essex/Harrison/Chauncy	A	B	B

400' Tower Traffic Impacts: Existing Essex Street Configuration. For the existing Essex Street configuration, the 400' Tower traffic volume levels are presented in Figures IV A-21, IV A-22 and IV A-23 for the morning, evening and Saturday peak hour period, respectively. It should be noted that the 400' Tower volumes are lower than the No-Build for turning movements at several intersections. The reason for this unusual condition is that the traffic routings for the new garage with its entrances on Lincoln and Kingston will be different than routings for the old garage with its entrance on Bedford Street, particularly from the west.

Table IV A-22 indicates the traffic operations for the 400' Tower assuming existing Essex Street conditions. The traffic operations analysis for the 400' Tower assumes the No Build traffic mitigation measures have been instituted.

All intersection locations in the study area operate within acceptable traffic operating conditions during all peak hour periods for the 400' Tower, with the exception of Essex/Washington in the PM peak hour, which operates at LOS E. Nevertheless, traffic operation impacts for the 400' Tower remain within the same LOS designations as in the No Build conditions with the exception of Bedford/Chauncy/Lafayette Place Garage during the Saturday peak hour period which changes from LOS B to LOS C. At most intersections, project traffic associated with the 400' Tower lengthens average vehicle delays by only a few seconds over the No Build condition.

Traffic operations for the 400' Tower at the garage entrances operate at acceptable LOS during the morning and Saturday peak hour periods. Although the Kingston-Bedford-Essex Garage exit along Kingston Street operates at LOS E during the evening peak hour period, this unsignalized location experiences

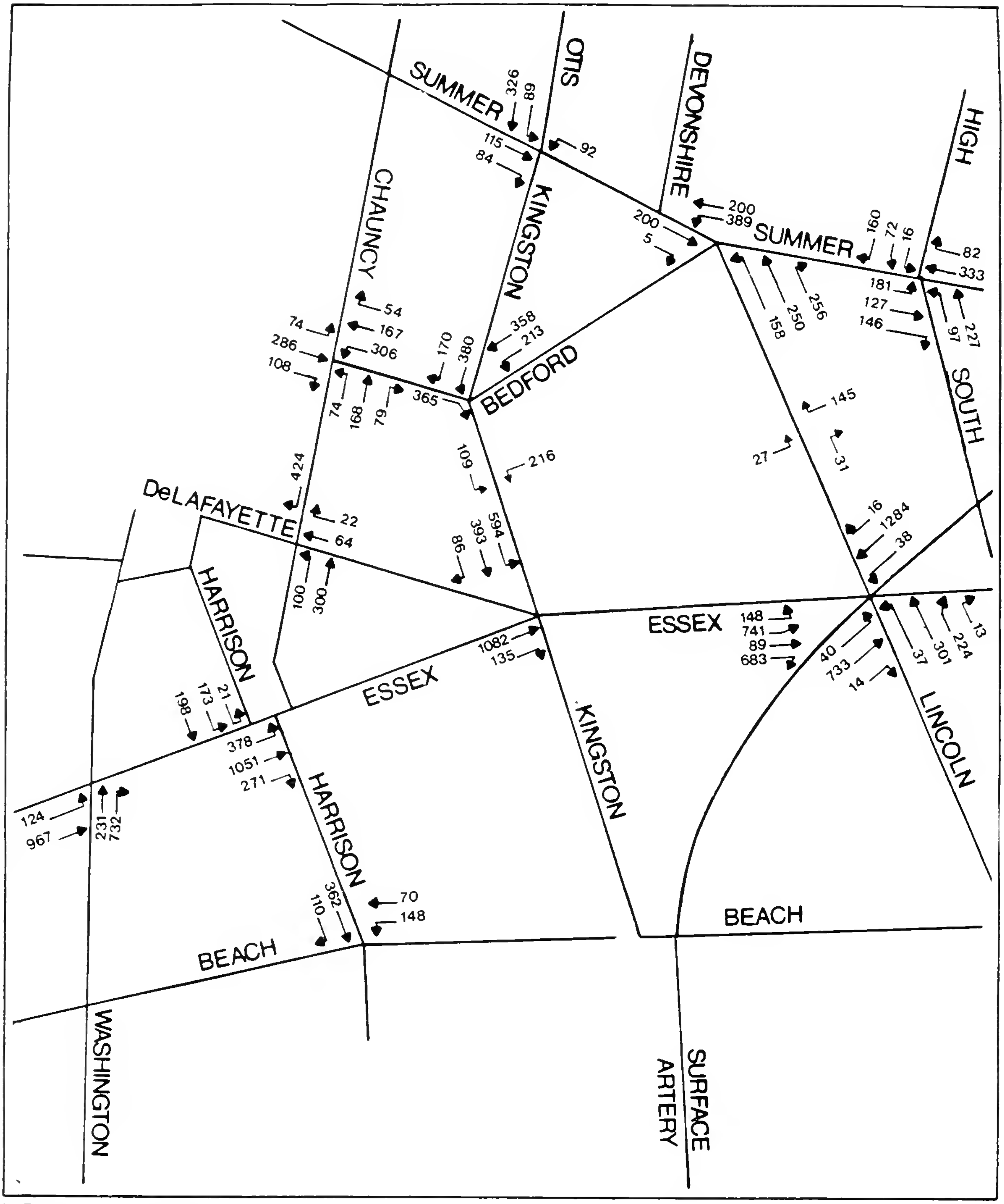


HOWARD/STEIN-HUDSON ASSOCIATES

400' TOWER
AM PEAK HOUR TRAFFIC VOLUMES
(existing Essex Street configuration)

N

Figure IV A-21

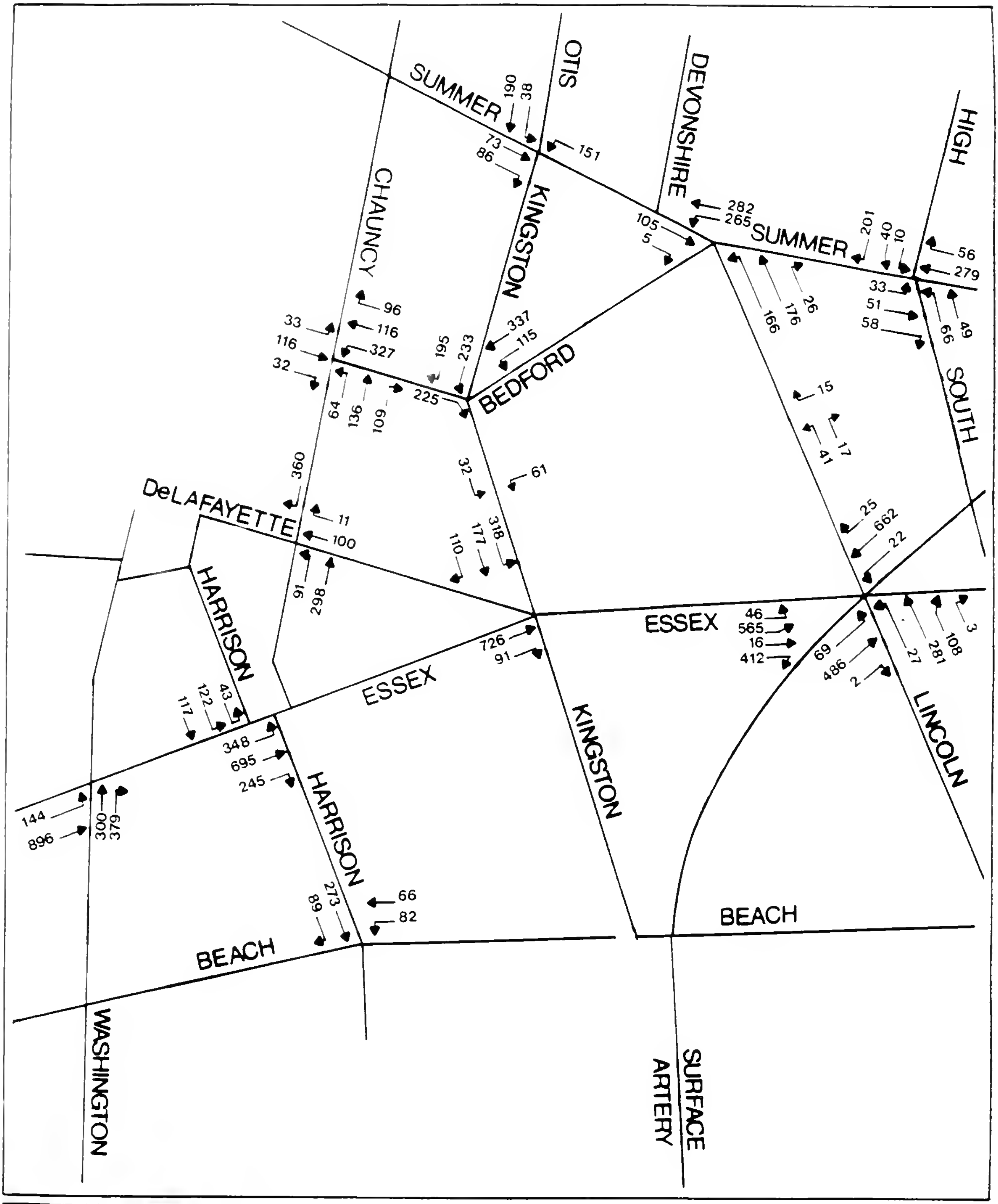


HOWARD/STEIN-HUDSON ASSOCIATES

400' TOWER
PM PEAK HOUR TRAFFIC VOLUMES
(existing Essex Street configuration)

N

Figure IV A-22



HOWARD/STEIN-HUDSON ASSOCIATES

400' TOWER
SAT. PEAK HOUR TRAFFIC VOLUMES
(existing Essex Street configuration)

Figure IV A-23

Table IV A-22

400' Tower - Traffic Operations Summary
(existing Essex Street configuration)

SIGNALIZED INTERSECTIONS

Intersection Location	AM PEAK HOUR LOS	AM PEAK HOUR Average Delay	PM PEAK HOUR LOS	PM PEAK HOUR Average Delay	SAT PEAK HOUR LOS	SAT PEAK HOUR Average Delay
Summer/High/South	B	12.43	B	7.49	B	7.75
Summer/Lincoln/Bedford	B	11.62	D	33.10	B	9.59
Summer/Otis/Kingston	B	6.81	B	7.11	B	7.18
Bedford/Kingston	B	8.20	B	12.57	B	10.16
Bedford/Chauncy/LP Garage	C	23.87	D	29.50	C	15.67
Essex/Surface Artery/Lincoln	D	29.67	D	32.78	C	17.99
Essex/Kingston/DeLafayette	B	7.62	B	10.65	B	8.03
Essex/Harrison/Chauncy	A	3.89	B	6.33	B	7.62
Essex/Washington	B	13.57	E	44.98	B	10.26

UNSIGNALIZED INTERSECTIONS

Intersection Location	AM PEAK HOUR LOS	AM PEAK HOUR Reserve Capacity	PM PEAK HOUR LOS	PM PEAK HOUR Reserve Capacity	SAT PEAK HOUR LOS	SAT PEAK HOUR Reserve Capacity
Bedford/Columbia						
Columbia NB	B	337	A	467	A	477
Harrison/Beach						
Beach WB	A	619	C	235	B	394
Kingston/KBE Garage						
Kingston SB (LT)	A	1179	A	1198	A	1271
KBE Garage	A	444	E	98	B	374
Lincoln/KBE & 125 Summer Garage						
KBE Garage	na	--	B	339	na	--
125 Summer Garage	A	889	A	756	A	981

an average delay of approximately 37 seconds with and average queue length of 1.7 vehicles. The proximity of the signalized intersections of Bedford/Kingston and Essex/Kingston/Ave. de Lafayette will provide sufficient gaps within the traffic stream to lessen this delay.

Effects of Two-Way Essex Street on No Build and 400' Tower Traffic. The two-way Essex Street roadway improvement option provides for two-way traffic operations along Essex Street from Kingston Street to Atlantic Avenue. For analysis purposes, this roadway improvement option was examined for the critical morning and evening peak hour periods only, since the Saturday peak hour traffic operations are well within acceptable levels of service for both the No Build and the 400' Tower alternatives. In addition, the two-way Essex Street roadway option was examined only at those intersection locations that would be directly impacted or at those locations that are approaching unacceptable traffic operating conditions for the No Build and 400' Tower alternatives. The analysis also assumed implementation of the mitigation measures previously identified under the No Build option.

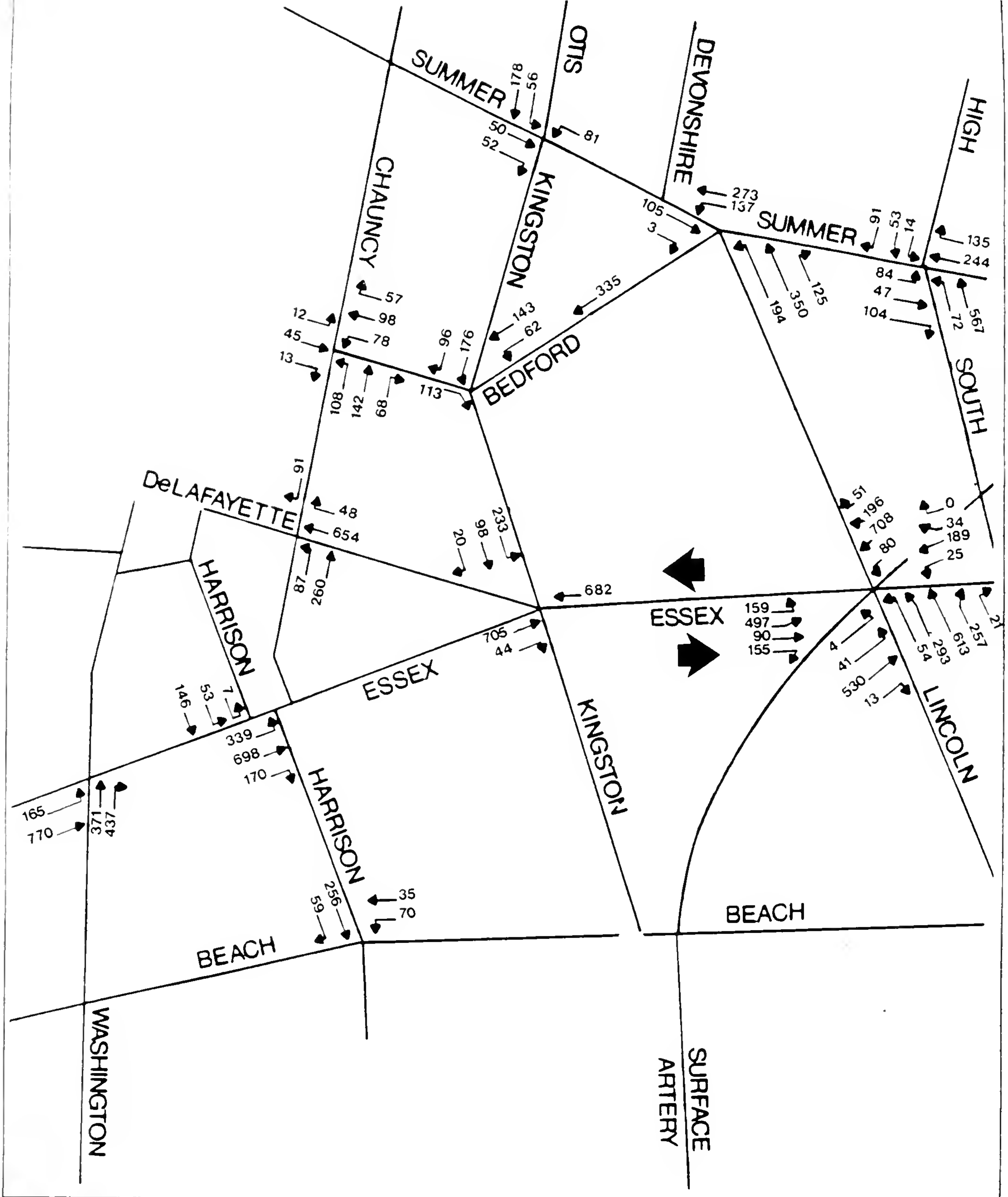
No Build. Traffic volume levels for No Build conditions during the morning and evening peak hour periods assuming a two-way Essex Street are presented in Figures IV A-24 and IV A-25, respectively. Figure IV A-26 identifies the estimated relative increase or decrease in traffic volumes along study area roadways under No Build conditions as a result of the two-way Essex Street roadway improvement option.

This roadway improvement provides for a shift in westbound traffic into the area and does not affect the volume of eastbound traffic along Essex Street. Westbound traffic volume along the improved Essex Street between Surface Artery and Kingston Street is expected to be on the order of 700 vehicles during the morning peak hour and 450 vehicles during the evening peak hour period.

The most significant shifts in traffic resulting from the two-way Essex Street improvement option are the following:

- expected increases in traffic along Avenue de Lafayette approaching Chauncy Street;

- traffic increases along Harrison Avenue between Avenue de Lafayette and Beach Street. These appear high when expressed as a percentage increase due to the low volumes of existing traffic along this section of roadway. The increases are mostly a result of improved access to Chinatown via two-way Essex Street;



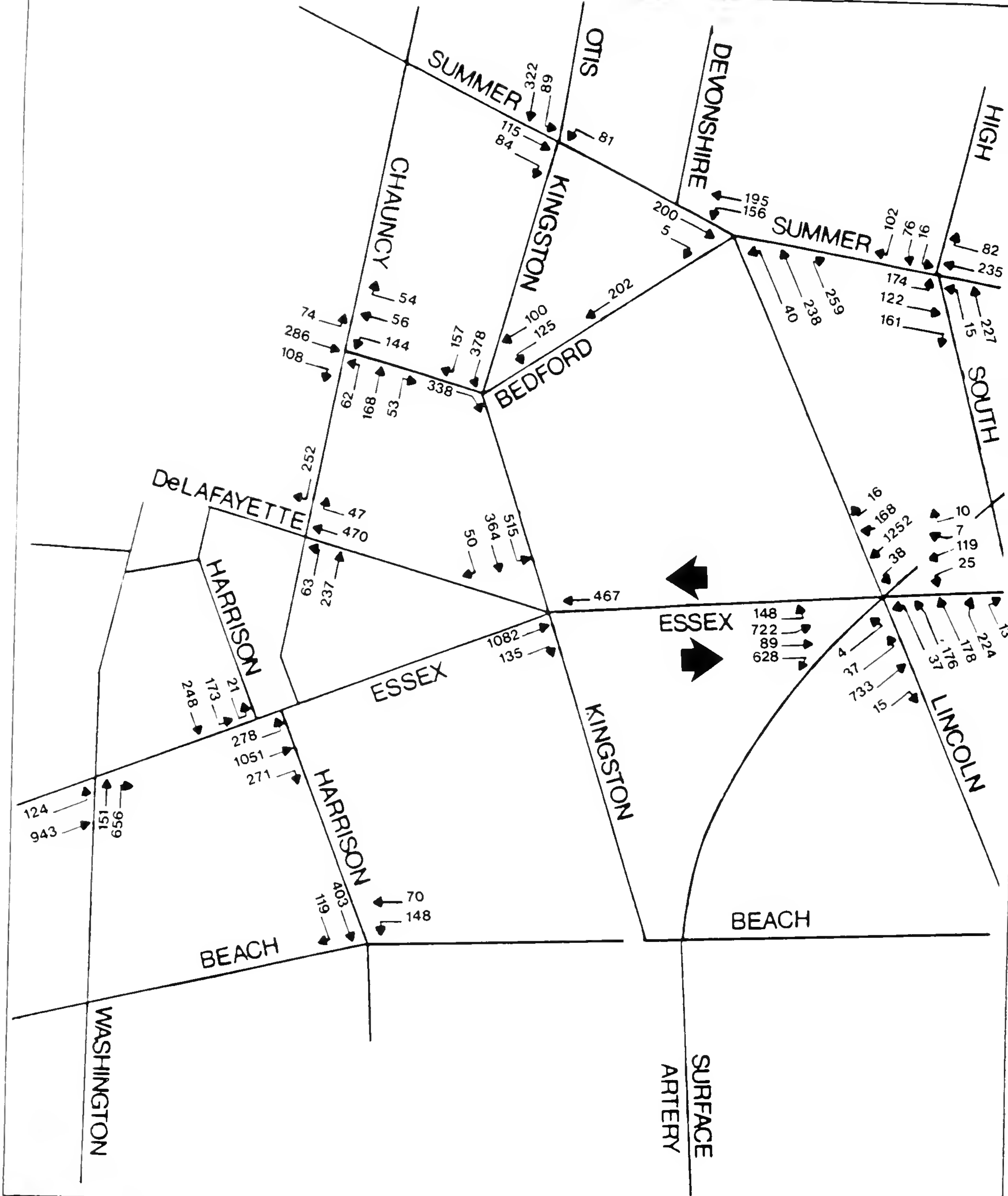
HOWARD / STEIN - HUDSON. ASSOCIATES

NO BUILD (1993) CONDITIONS - AM PEAK HOUR TRAFFIC VOLUMES

(two-way Essex Street)

N

Figure IV A-24



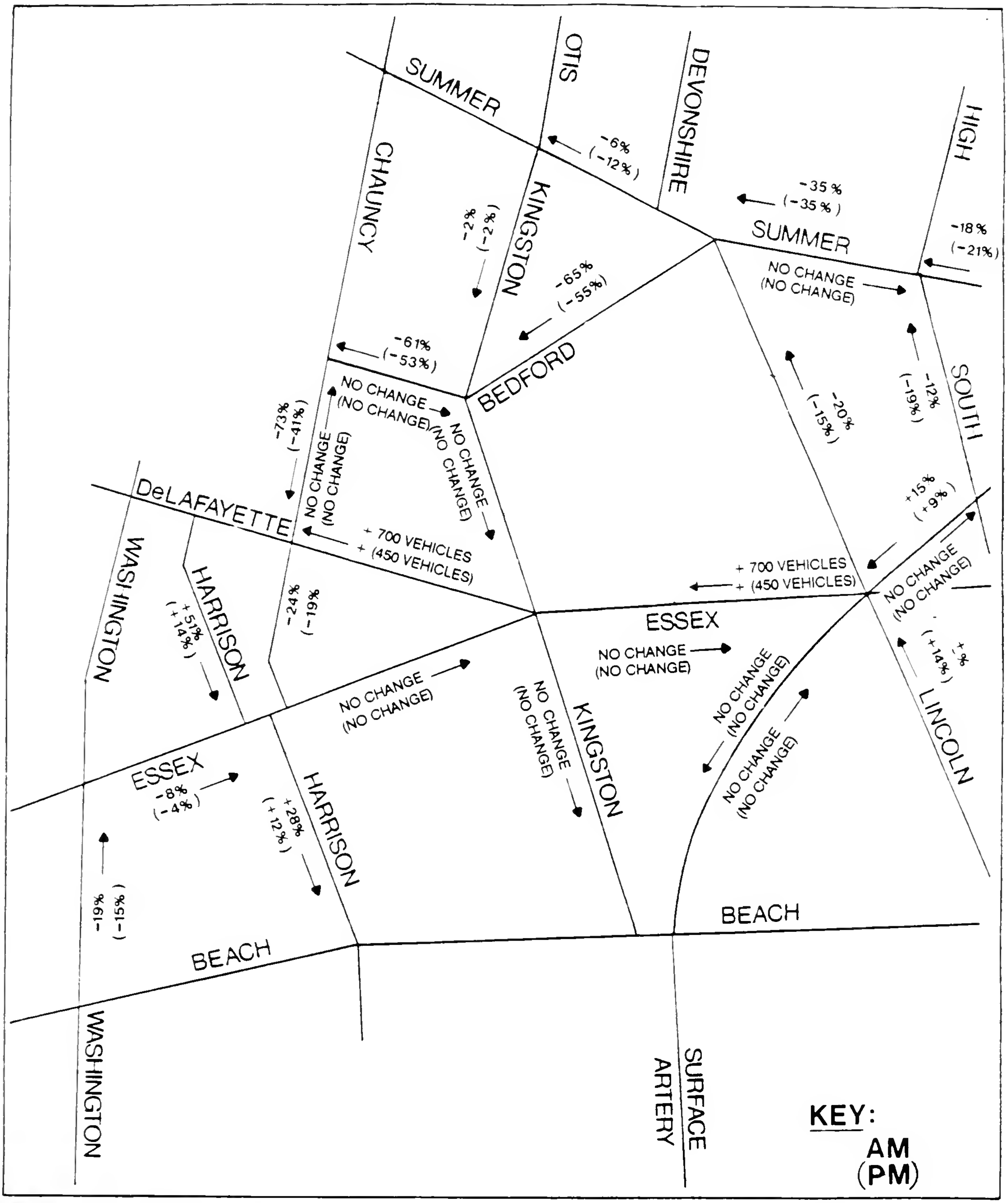
Howard/Stein-Hudson Associates

NO BUILD (1993) CONDITIONS - PM PEAK HOUR TRAFFIC VOLUMES

(two-way Essex Street)

N

Figure IV A-25



HOWARD/STEIN-HUDSON ASSOCIATES

RELATIVE TRAFFIC VOLUME CHANGES - TWO-WAY ESSEX STREET

N

Figure IV A-26

- significant decreases in traffic volumes along Bedford Street, Summer Street (westbound) between South Street and Lincoln Street and southbound along Chauncy Street between Bedford Street and Avenue de Lafayette;

- smaller decreases in traffic volumes north of the Surface Artery along Lincoln Street, South Street and Summer Street (westbound);

- decreased volumes along Essex Street eastbound between Tremont and Washington, particularly in the AM peak hour, due to the fact that traffic destined for Boston Crossing or Commonwealth Center parking garages can approach the area from the south by using New Essex WB to Ave. de Lafayette WB rather than Kneeland Street to Washington then Ave. de Lafayette EB; and

- decreased traffic volumes along Chauncy Street north of Essex Street to Avenue de Lafayette and Washington Street between Kneeland Street and Avery Street.

<u>400' Tower</u>. Figures IV A-27 and IV A-28 indicate traffic volumes for the 400' Tower during the morning and evening peak hour periods for the same two-way Essex Street roadway improvement option. Table IV A-23 presents the traffic operations for both the No Build and 400' Tower alternatives with two-way Essex Street.

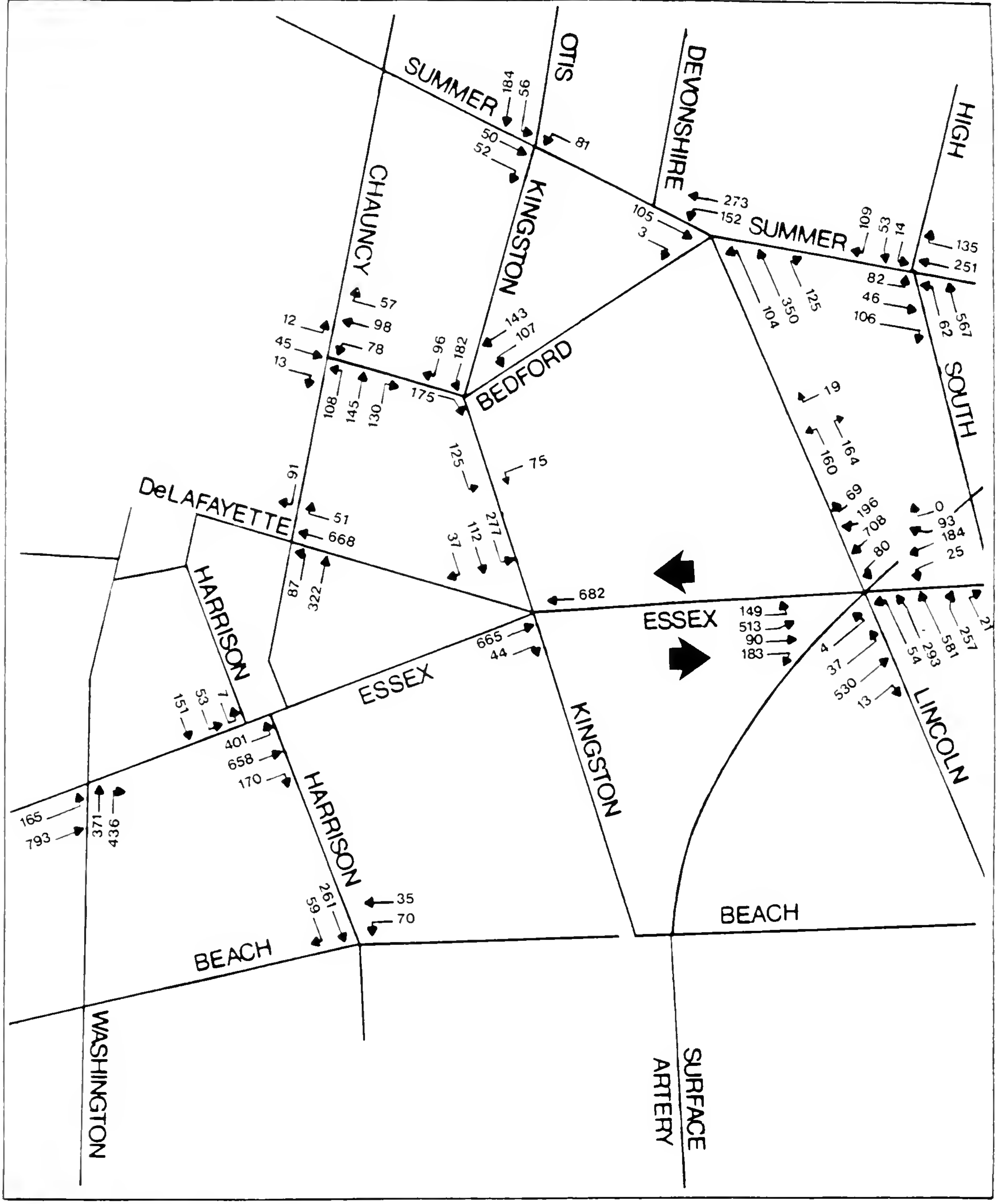
Not surprisingly, two-way Essex Street improves traffic operations at those intersection locations where traffic is significantly reduced. The average expected delay at each location improves over the existing Essex Street case during all peak hour periods at these locations, as follows:

- Summer/Lincoln/Bedford improves from LOS D to LOS B during the evening peak hour period;

- Bedford/Chauncy/Lafayette Place Garage intersection improves from LOS C and D during the morning and evening peak hours respectively to LOS B during both peak hour periods; and

- Essex/Washington improves from LOS E to LOS D during the evening peak hour period.

At the same time, those intersections which experience increased traffic volumes are expected to remain within acceptable traffic operational levels of service during all peak hour periods, with the important exception of Essex/Surface Artery/Lincoln, where an anomaly exists, as is dealt with below.

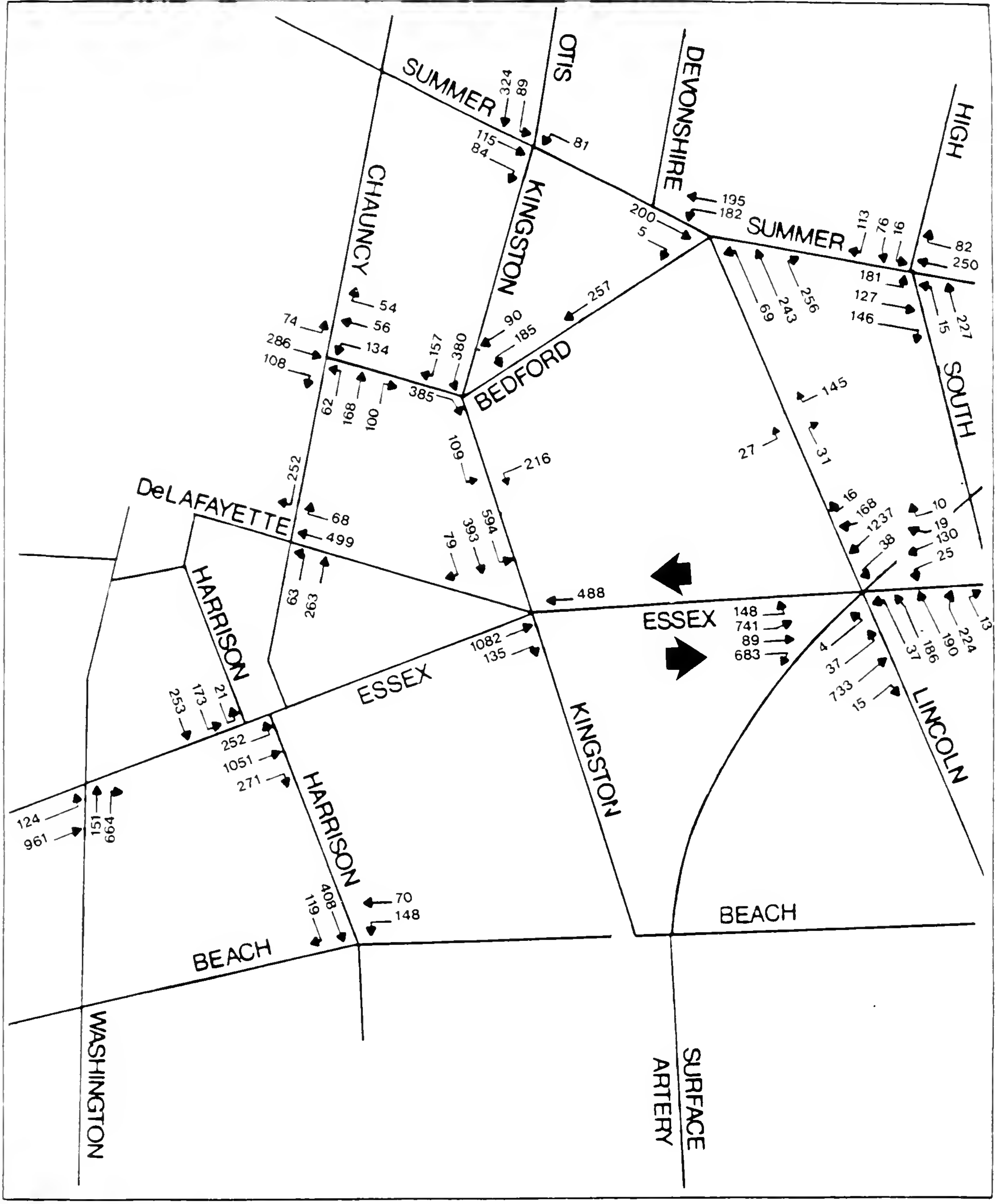


HOWARD/STEIN-HUDSON ASSOCIATES

400' TOWER
AM PEAK HOUR TRAFFIC VOLUMES
(two-way Essex Street)

N

Figure IV A-27



HOWARD/STEIN-HUDSON ASSOCIATES

400' TOWER
PM PEAK HOUR TRAFFIC VOLUMES
(two-way Essex Street)

N

Figure IV A-28

Table IV A-23

Two-Way Essex Street - Traffic Operations Summary

SIGNALIZED INTERSECTIONS

Intersection Location	NO BUILD (1993) CONDITIONS AM PEAK HOUR LOS	AM PEAK HOUR Average Delay	PM PEAK HOUR LOS	PM PEAK HOUR Average Delay	ALTERNATIVE 1 CONDITIONS AM PEAK HOUR LOS	AM PEAK HOUR Average Delay	PM PEAK HOUR LOS	PM PEAK HOUR Average Delay
Summer/Lincoln/Bedford	B	8.87	C	17.08	B	9.13	C	17.66
Bedford/Chauncy/LP Garage	B	8.56	B	9.84	B	9.17	B	11.58
Essex/Surface Artery/Lincoln	F	81.24	E	48.74	F	89.20	E	58.73
(with one-way Surface Artery)					(E	50.35)	(D	31.78)
Essex/Kingston/DeLafayette	B	6.40	B	10.55	B	7.15	B	12.47
Essex/Washington	B	10.13	D	28.46	B	11.66	D	30.55
Chauncy/Ave. DeLafayette	B	7.30	B	7.60	B	7.86	B	7.75

UNSIGNALIZED INTERSECTIONS

Intersection Location	NO BUILD (1993) CONDITIONS AM PEAK HOUR LOS	AM PEAK HOUR Reserve Capacity	PM PEAK HOUR LOS	PM PEAK HOUR Reserve Capacity	ALTERNATIVE 1 CONDITIONS AM PEAK HOUR LOS	AM PEAK HOUR Reserve Capacity	PM PEAK HOUR LOS	PM PEAK HOUR Reserve Capacity
Kingston/KBE Garage								
Kingston SB (LT)	na	--	na	--	A	1172	A	1192
KBE Garage	na	--	na	--	A	454	D	101
Lincoln/KBE & 125 Summer Garage								
KBE Garage	na	--	na	--	na	--	A	403
125 Summer Garage	na	--	na	--	A	970	A	810

Two-way Essex Street is shown to be a necessary improvement to cope with the substantial proposed no build development between the Surface Artery and Tremont Street. At the intersection of Essex and Surface Artery, however, the creation of a two-way Essex does not lead traffic away from the intersection, but adds volumes to it for access to the west. Without physical changes, one can only expect a worsening of LOS when a two-way condition is established. Not only does the volume increase, but Essex Street left turns which have no opposing volumes in the one-way condition must face such if the street is two-way.

This can be seen in the LOS analysis summary in Table IV A-23 where the no-build one-way Essex peak hour LOS of D in both the AM and PM become F and E, respectively, under the two-way operation of Essex Street. For the 400' Tower, the comparable one-way LOS D for both peaks become (lower) F and E.

The solution to this situation can be found in the fact that practically from the inception of the proposal of two-way Essex, the concept was coupled with the idea of making the Surface Artery one-way southbound, widened to four lanes, using part of the area freed up from the elimination of the northbound direction. This allows improvement of pedestrian crossing conditions, as well as being necessary to serve a reversal of the unused Lincoln Street off-ramp to provide a southbound on-ramp in the future reconstruction of the Central Artery.

If a widened one-way southbound Surface Artery is coupled with the two-way Essex Street, LOS can be improved substantially to E and D in the AM and PM peak hours in the Build Alternative 1 scenarios, respectively. These critical condition values are shown in Table IV A-23 in parentheses.

It must be pointed out, however, that the analysis process becomes more uncertain as more variations are introduced -- such as two-way Essex coupled with a one-way Surface Artery. First, the northbound direction of the Surface Artery has to be displaced somewhere, likely to some combination of Atlantic Avenue, and South Street, but involving some possibility of indirect diversion to streets to the west to a small degree. The analysis showing the improved LOS does not account for the rerouting of the northbound Surface Artery, but was intended to show the betterment obtained from widening the southbound portion.

Further, the reconstruction of the Central Artery, although to be accomplished beyond the analysis year of this report, will cause significant changes in traffic in the area dealt with herein. The rearrangement of ramps (e.g. Lincoln) will also cause shifts in traffic along the Surface Artery. Improved operations on the Central Artery itself will also lead to a

reduction of peak hour use of local streets in the Surface Artery corridor for traffic wishing to bypass the current peak hour congestion in and near the Dewey Square Tunnel.

In overview, the two-way Essex proposal is a necessary measure to adequately serve existing and future development in the study area while also serving to relieve traffic problems on other streets. The creation of two-way Essex, however, worsens conditions at the Surface Artery in the short term. However, proposed Central Artery changes will probably ease congestion in Dewey Square and relieve the added burdens at Essex/Lincoln/Surface Artery.

Parking Supply and Demand Impacts. As stated above, existing parking supply in the study area is 5,424 spaces of which 80% are open to the public and 20% private, and of which 90% are in garages and 10% are in lots. On the Kingston-Bedford-Essex parcel itself, there are 731 spaces which will be displaced by the proposed development, as follows:

- Kingston/Bedford Garage --	550 spaces
- Lincoln/Essex Lot --	130 spaces
- 128-130 Essex Street Lot --	51 spaces
Total on-site:	731 spaces

All of these spaces are open to the public, with all day rates of \$9.50 per day at the garage, \$12 at the 128-130 Essex St. lot and \$13 at the Lincoln/Essex lot. The lot rates are at market levels for the downtown subarea. The garage rate is one of the lowest in the district. As stated above, occupancy within the study area is about 88% of capacity at midday. While this rate does not indicate a liberal surplus of parking, it does suggest that the existing supply and demand are close to equilibrium; i.e., the supply essentially meets the demand.

To establish No Build 1993 parking supply and demand forecasts, the parking demand was first estimated for the design year background development and compared to net additional parking supply to be provided in conjunction with the new projects, as shown in Table IV A-24. This calculation yielded an overall deficit of 1,200 spaces within the study area for 1993, excluding the Kingston-Bedford-Essex development.

Parking demand for each of the proposed options was then determined through applying average parking duration, arrival time, and turnover rates for each land use to the vehicle trips developed in the trip generation analysis. Work trip vehicles are assigned as all day parkers for each land use. Nonwork trip vehicles are assigned a turnover rate of 3 for retail autos (i.e. three cars are assumed to use each space during the course of a

Table IV A-24

Parking Demand Analysis
Design Year (1993) Background Development

Parameter	Hotel Work	Hotel Nonwk	Office Work	Office Nonwk	Retail Work	Retail Nonwk	Total: Work	Total: Nonwk	Total
Daily Vehicles (in + out)	0	0	3649	2401	479	2317	4128	4718	8846
Round Trips	0	0	1825	1201	240	1159	2064	2359	4423
Peak Demand	0	0	1825	450	240	386	2064	836	2900

Net New Parking Proposed:	1703
Surplus or Deficit:	-1197

Assumptions:
- hotel peak demand based on one space per work round trip parked during peak hour -- 2-3 p.m.
- all work trips included in peak demand
- retail nonwork divided by 3.0 turnover
- office nonwork divided by 2.67 turnover

Table IV A-25

Comparative Parking Demand by Land Use for Build Alternatives

Alternative	Hotel: Work	Hotel: Nonwk	Office Work	Office Nonwk	Retail: Work	Retail: Nonwork	Total: Work	Total: NonWk	Project Total	New Spaces Proposed	Surplus or Deficit	Project plus Re-placement	Surplus Or Deficit
400' Tower	83	74	413	98	16	27	512	199	711	800	89	1442	-642
325' Tower	66	59	354	84	19	31	439	174	613	600	-13	1344	-744
250' Tower	55	49	293	69	19	31	367	149	516	600	84	1247	-647
Expanded Site	83	74	333	79	22	36	438	189	627	800	173	1358	-558
Dev. Proposal	0	0	507	120	40	65	547	185	732	900	168	1463	-563

day), and 2.67 for office non-work trips. Hotel non-work parking patterns trips are more similar to residential uses than commercial uses in that they peak in the evening. Hotel parking was thus assumed at 35% levels during the peak hour (approximately 2:00 PM). The resulting parking demand, compared to the proposed supply for each alternative is shown in Table IV A-25.

As shown in the table, the 400' Tower and the Developer's Proposal generate the highest parking demand at 711 and 732 spaces respectively. The 325' Tower and the Expanded Site generate demand for 613 and 627 spaces, and the 250' Tower for 516 spaces. Of these, demand for employee spaces ranges from a low of 367 for the 250' Tower to a high of 547 employee spaces for the Developer's Proposal. For nonwork spaces (i.e., customers and visitors), demand ranges from 149 spaces for the 250' Tower to 199 spaces for the 400' Tower.

Table IV A-25 also shows proposed parking supply for each build alternative, compared to the total project demand. The table also compares the new supply to the combined total needs to accommodate project demand plus replacement parking which will be removed from the site. As shown, supply basically meets or exceeds project parking demand levels for each build alternative. However, if all the displaced parking were to be replaced on site, there would be a deficit ranging from 558 spaces for the Expanded Site to 744 spaces for the 325' Tower. Added to the no-build deficit, this would yield a total study area deficit of 1,758 spaces to 1,944 spaces for 1993.

This apparent parking deficit must be interpreted in light of City of Boston policies to discourage worker auto access to downtown Boston through parking pricing and supply management, and in light of MBTA policies to increase fringe parking at its outlying transit and commuter rail stations. The extent to which the City is desirous of replacing parking within the downtown, particularly for workers, is a complex policy issue.

The difference between employee and non-work spaces influences how spaces are treated with respect to the City of Boston's parking freeze within Boston Proper. The parking freeze sets a cap on commercial parking not to exceed the level of spaces in place as of October 15, 1973. Reserved employee spaces which are not open to the general public are exempt from the parking freeze, as are residential spaces and any free customer or visitor spaces. Any spaces open to the general public for a fee are subject to the parking freeze. The freeze imposes the condition that for every new commercial space created, an existing space must be eliminated.

The Kingston-Bedford-Essex development will eliminate 731 parking spaces existing on the site in 1988. However, in October, 1973 there were actually 1,120 spaces existing on the site, as follows:

- full capacity of Kingston/Bedford mechanical garage: 735 spaces

- Lincoln-Essex Garage (a city-owned mechanical garage, later demolished, and now the Lincoln-Essex lot): 334 spaces

- 128-130 Essex Street lot lot: 51 spaces.

The parking freeze issue will be dealt with through the City of Boston's permitting process.

Public Transportation System Impacts. Because the site is so well located with respect to the MBTA system, public transportation is estimated to handle a significant percentage of project-generated trips. In this section, the relative impacts of these added trips on the various public transportation modes are examined.

As stated above, the concept of public transportation system capacity is complex, involving equipment availability, schedules, MBTA parking facility capacity, signal systems, maintenance, and labor force allocation issues. While it is relatively straightforward to derive a theoretical peak hour capacity, based on total vehicles and minimum schedules, other factors may make such a target unfeasible. For example, adding new cars on the shorter Green Line trains may not be possible until funds are allocated for new drivers. Similarly, because new Red Line cars are going first toward replacing unreliable older equipment, the added system capacity is not equal to the number of new vehicles. Nevertheless, the service will still improve due to increased reliability, a more difficult measure to quantify.

Given these difficulties, an attempt was nonetheless made to compare the relative added demands on the transit system made by the No Build Alternative and the five build alternatives.

- The "no build" transit trips for design year (1993) were first allocated to the transit and bus lines according to the estimated proportion of directional volumes by line. The resulting trip table is shown in Table IV A-26. As shown, the background development adds 2,210 transit trips in the morning peak hour, (increasing passenger volumes by 3.8%), and 2,504 trips in the evening peak hour (increasing passenger volumes by 3.7%). The most trips are added to the Red Line north and south (comprised of Ashmont and Braintree

Table IV A-26

Assignment of 1993 Public Transportation Person Trips
Generated by No Build Background Development
and Project Alternatives

AM PEAK HOUR, PEAK DIRECTION -- INBOUND

Line/ Direction	Percent Distrib.	Ground Trips	Back- Build 1 Trips	Build 2 Trips	Build 3 Trips	Build 4 Trips	Build 5 Trips
Red/North	16.4%	362	124	103	83	101	147
Red/South	17.5%	387	133	110	89	108	156
Blue/North	10.4%	230	79	66	53	64	93
Orange/North	8.0%	177	61	50	41	49	72
Orange/South	10.8%	239	82	68	55	66	97
Green/West	15.9%	351	121	100	81	98	142
Green/East	2.0%	44	15	13	10	12	18
Com. Rail No.	4.0%	88	30	25	20	25	36
Com. Rail So.	5.0%	111	38	32	25	31	45
Exp. Bus	1.8%	40	14	11	9	11	16
Other Bus	7.9%	175	60	50	40	49	71
Commuter Boat	0.3%	7	2	2	2	2	3
Total	100.0%	2,210	759	630	508	616	896

PM PEAK HOUR, PEAK DIRECTION -- OUTBOUND

Line/ Direction	Percent Distrib.	Ground Trips	Back- Build 1 Trips	Build 2 Trips	Build 3 Trips	Build 4 Trips	Build 5 Trips
Red/North	16.4%	411	113	95	78	92	137
Red/South	17.5%	438	120	102	83	99	146
Blue/North	10.4%	260	71	61	50	59	87
Orange/North	8.0%	200	55	47	38	45	67
Orange/South	10.8%	270	74	63	52	61	90
Green/West	15.9%	398	109	93	76	90	133
Green/East	2.0%	50	14	12	10	11	17
Com. Rail No.	4.0%	100	27	23	19	23	33
Com. Rail So.	5.0%	125	34	29	24	28	42
Express Bus	1.8%	45	12	10	9	10	15
Other Bus	7.9%	198	54	46	38	45	66
Commuter Boat	0.3%	8	2	2	1	2	3
Total	100.0%	2,504	687	583	478	565	836

Car Capacity: Red Line -- 180 Green Line -- 165
Blue Line -- 110 Orange Line -- 155

branches) and the Green Line west (comprised of B, C, D, and E Lines). For each line, the number of car/bus loads represented by these passenger totals can be calculated by dividing the added passengers by the car capacity. Summarized, the background growth would increase peak transit demand by up to two carloads per direction per line. When the volumes are further allocated to individual branch lines, of course, the numbers would decrease.

- The transit trips for the five build alternatives were then distributed to the transit lines in the same way, as also shown in Table IV A-26. As shown, total AM peak hour trips ranged from 507 for the 250' Tower to 894 for the Developer's Proposal. Total PM peak hour trips ranged from 477 for the 250' Tower to 837 for the Developer's Proposal. Summarized, the build options add up to one carload of passengers in the peak hours to the demands of the No Build alternative, increasing the total added demand to 2-3 additional carloads per peak hour per line. In the highest impact case (Developer's Proposal) total 1993 AM peak hour passenger volumes rise by 3,104 (5.4%); total 1993 PM peak hour passenger volumes rise by 3,341 (5.0%).

Given the many branch lines involved, the many choices of transit stations available downtown, the fact that these trips will be dispersed throughout the peak hour, plus the flexibility of scheduling and train length available to the system today, and equipment additions already planned, the conclusion is that the impact of any of the options can be reasonably handled by the MBTA.

New Essex Street MBTA Transit Line. An additional long-term transit planning issue which must be addressed in planning the Kingston-Bedford-Essex development is the compatibility of the development's underground parking structure with a proposed transit tunnel under Essex Street. The MBTA is exploring various options for an underground people mover, light rail or bus line along Essex Street extending from the Boylston Green Line station to the Fort Point Channel development area of South Boston.

As outlined by the MBTA, the tunnel would occupy 50' of Essex Street, as shown in Figures IV A-29 and IV A-30. The top of the tunnel would be about 50' to 55' in depth. Preliminary MBTA and development plans showed the proximity between the northern tunnel tube and the fifth parking level. By agreement with the MBTA this conflict is being presented in the DEIR's for each project with the intent that problems be resolved in the design stages. Correspondence with the MBTA on the matter is contained in Appendix T6.

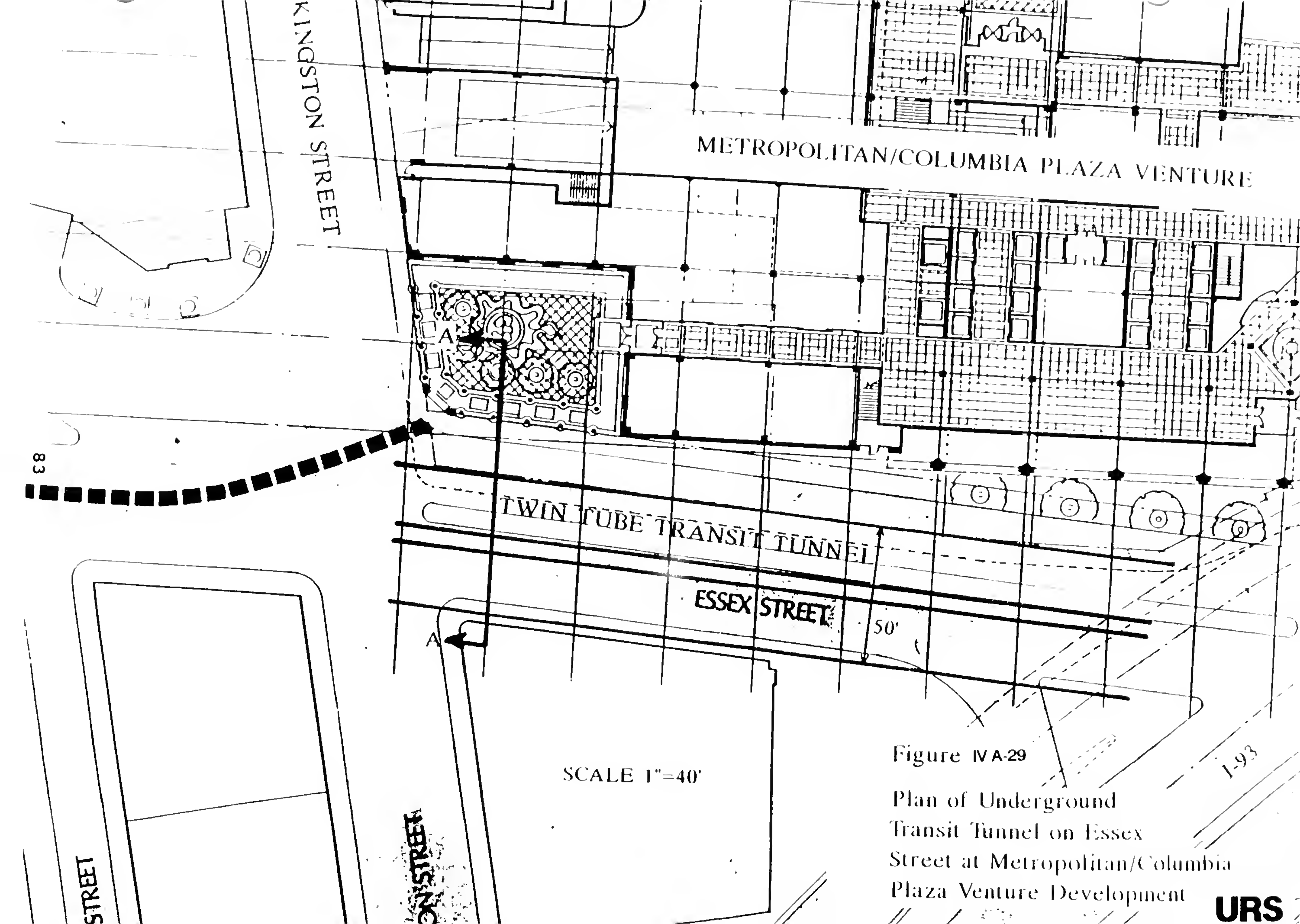


Figure IV A-29

Plan of Underground Transit Tunnel on Essex Street at Metropolitan/Columbia Plaza Venture Development

URS

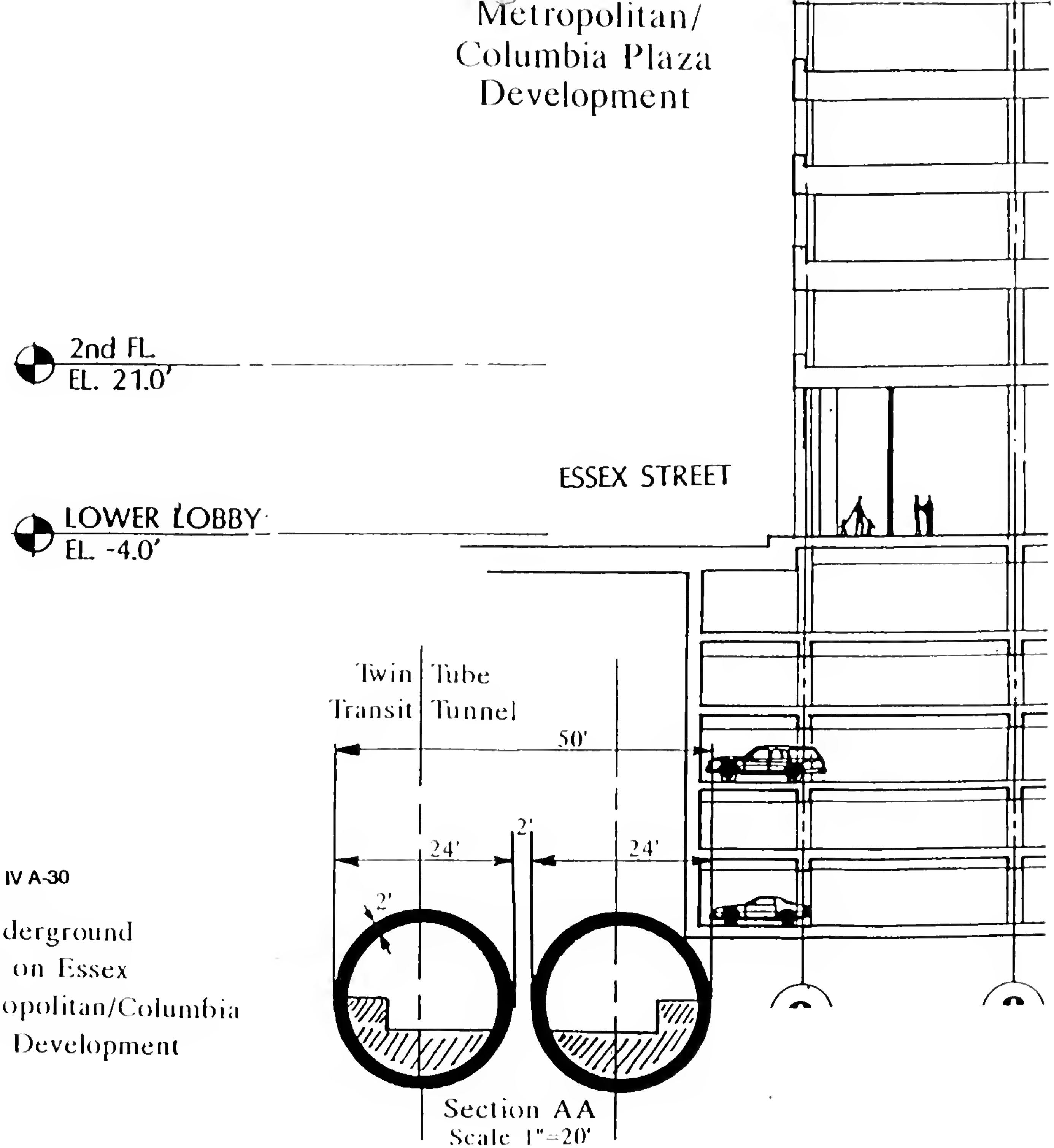


Figure IV A-30

Section of Underground Transit Tunnel on Essex Street at Metropolitan/Columbia Plaza Venture Development

URS CONSULTANTS MAKING TECHNOLOGY WORK

Pedestrian Impacts. The main issues involved in assessing the impacts of the project on pedestrian flows are related to the building's entry points and site plan. The key factor is the extent to which the project's entrances and ground level flow patterns reinforce desired pedestrian pathways. In the case of this project, the key pedestrian movements to be accommodated are the following:

- peak hour commuter movements to and from the site and nearby transit stations -- primarily South Station, Washington Station, and Chinatown Station;

- midday, Saturday and (to some extent) evening movements to and from the site and Downtown Crossing; and

- daily and weekend movements through and around the site to and from Chinatown and Downtown Crossing.

Pedestrian volumes for each of five proposed building entrances were estimated as described above. Total daily, Saturday, and peak hour pedestrian volumes using each entrance for each of the build alternatives are shown in Table IV A-27. As shown, the Developer's Proposal generates the highest daily volumes of pedestrians, with a maximum of 4,600 per day projected to use the Bedford/Kingston entrance. For each alternative, Saturday daily volumes are one-half or less of the weekday volumes due to the high proportion of office use. The maximum weekday peak hour volume is about 600 at the Kingston-Bedford-Essex entrance, under the Developer's Proposal. Because the pedestrians have several choices at this point as to direction, and because this intersection will be controlled by a traffic signal, this volume can be readily accommodated at the street corner and crosswalks. The increased pedestrian volumes for each alternative have been taken into account in the calculations for the intersection traffic capacity analysis.

Additional Traffic Mitigating Measures. Design improvements to improve the physical and operational capacity of surrounding intersections to handle development traffic are a major means of mitigating project generated traffic impacts. However, no less important than these "supply side" measures are programs to help reduce the demand for auto use by employees and visitors. This can be done through several types of "commute management" actions, as described below.

Encourage Transit Use. The Kingston-Bedford-Essex development parcel's prime location at the hub of the MBTA system makes encouragement of transit use a primary mitigating measure. In the first place, the developer can stress the site's excellent transit access in the marketing materials prepared during the

Table IV A-27
Pedestrian Distribution Analysis for
Build Alternatives

BUILD ALTERNATIVE 1:

	PEDESTRIAN TRIPS: TO/FROM TRANSIT	WALK	TOTAL	ENTRANCES: Kingston/ Bedford	Lincoln Arcade	Lincoln/ Essex	Kingston/Bedford Essex	Arcade
AVERAGE DAILY	6027	2792	8819	4586	2646	529	529	529
AM PEAK								
IN	759	220	979	509	294	59	59	59
OUT	114	81	195	101	59	12	12	12
PM PEAK								
IN	171	112	283	147	85	17	17	17
OUT	687	194	881	458	264	53	53	53
SATURDAY TOTAL	2495	1630	4125	2145	1238	248	248	248
SAT. PEAK								
IN	103	80	183	95	55	11	11	11
OUT	96	96	50	29	6	6	6	6

BUILD ALTERNATIVE 2:

TIME PERIOD	PEDESTRIAN TRIPS: TO/FROM TRANSIT	WALK	TOTAL	ENTRANCES: Kingston/ Bedford	Lincoln Arcade	Lincoln/ Essex	Kingston/Bedford Essex	Arcade
AVERAGE DAILY	5233	2469	7702	4005	2311	462	462	462
AM PEAK								
IN	631	178	809	421	243	49	49	49
OUT	93	65	158	82	47	9	9	9
PM PEAK								
IN	144	94	238	124	71	14	14	14
OUT	582	165	747	388	224	45	45	45
SATURDAY TOTAL	2270	1553	3823	1988	1147	229	229	229
SAT. PEAK								
IN	99	79	178	93	53	11	11	11
OUT	92	68	160	83	48	10	10	10

BUILD ALTERNATIVE 3

TIME PERIOD	PEDESTRIAN TRIPS: TO/FROM TRANSIT	WALK	TOTAL	ENTRANCES: Kingston/ Bedford	Lincoln Arcade	Lincoln/ Essex	Kingston/ Essex	Bedford Arcade
AVERAGE DAILY	4416	2135	6551	3407	1965	393	393	393
AM PEAK								
IN	507	142	649	337	195	39	39	39
OUT	74	51	125	65	38	8	8	8
PM PEAK								
IN	119	79	198	103	59	12	12	12
OUT	477	138	615	320	185	37	37	37
SATURDAY TOTAL	1995	1422	3417	1777	1025	205	205	205
SAT. PEAK								
IN	90	75	165	86	50	10	10	10
OUT	86	64	150	78	45	9	9	9

BUILD ALTERNATIVE 4:

TIME PERIOD	PEDESTRIAN TRIPS: TO/FROM TRANSIT	WALK	TOTAL	ENTRANCES: Kingston/ Bedford	Lincoln Arcade	Lincoln/ Essex	Kingston/ Essex	Bedford Arcade
AVERAGE DAILY	5371	2733	8104	4214	2431	486	486	486
AM PEAK								
IN	615	189	804	418	241	48	48	48
OUT	96	73	169	88	51	10	10	10
PM PEAK								
IN	151	108	259	135	78	16	16	16
OUT	564	173	737	383	221	44	44	44
SATURDAY TOTAL	2486	1795	1281	2226	1284	257	257	257
SAT. PEAK								
IN	107	89	196	102	59	12	12	12
OUT	97	75	172	89	52	10	10	10

BUILD ALTERNATIVE 5:

TIME PERIOD	PEDESTRIAN TRIPS: TO/FROM TRANSIT	WALK	TOTAL	ENTRANCES: Kingston/ Bedford	Lincoln Arcade	Lincoln/ Essex	Kingston/ Essex	Bedford Arcade
AVERAGE DAILY	6299	2544	8843	4598	2653	531	531	531
AM PEAK								
IN	894	207	1101	573	330	66	66	66
OUT	112	63	175	91	53	11	11	11
PM PEAK								
IN	182	94	276	144	83	17	17	17
OUT	837	214	1051	547	315	63	63	63
SATURDAY TOTAL	2550	1616	4166	2166	1250	250	250	250
SAT. PEAK								
IN	113	80	193	100	58	12	12	12
OUT	106	76	182	95	55	11	11	11

initial leasing process for the building. Once tenants are selected, transit access can be stressed in employment recruitment. Employment advertising by major tenants in MBTA buses and trains will help tap this work force. Once the building is operational, MBTA pass sales can be arranged on site, either in a sales office run by building management in one of the buildings or through payroll deduction by the employers. Employers can also be encouraged to offer a small subsidy of the MBTA pass; even a 25% subsidy (less than $10 per month) is very effective in increasing transit use.

Encourage Ridesharing. In the Boston region, developers and employers can utilize the services of CARAVAN, the regional ridesharing agency, to help initiate ridesharing programs, including carpools, vanpools, and subscription bus services. One particularly effective service which CARAVAN offers is assistance to new tenants in solving relocating employees' commute problems. This service can be utilized by the developer during the leasing process to help market the space. Once employers are located, CARAVAN will help them implement ridesharing programs and form employee carpools. The State has several funding programs in place to support private sector efforts as well. CARAVAN has been very active to date in the Longwood Medical Area nearby.

The Kingston-Bedford-Essex project developer and building manager can also support ridesharing efforts through parking pricing and supply management. Beyond monthly spaces included in leases, reserving a small pool of monthly spaces for carpools and vanpools, perhaps at a slightly reduced rate, is one way to help insure ridesharing if parking availability is limited. Pricing and control of the opening hours of the supply of spaces open to the public to discourage all-day parking is also desirable.

Flexible Work Hours. Largely beyond the control of the project developer is institution of flexible working hours, in other words, arrangements whereby employees can vary working schedules to avoid peak demand periods. The receptivity of employers to these types of programs varies by the type of business. Informally, the developer can distribute information about these programs to prospective tenants, and also keep track of the working hours of major tenants during the leasing process to help coordinate schedules, if possible.

Transportation Coordinator. One key to successful implementation of these actions is an active effort by the developer to incorporate the idea of demand management into project marketing and leasing in a very positive way. This can be done through offering the services of a "transportation coordinator," who can be designated from the existing marketing staff. This individual can work with CARAVAN to learn about available programs, prepare

the required promotional materials, and launch ridesharing and transit efforts as appropriate. Once the project is fully tenanted, the function can be carried out as part of the building management on an ongoing basis.

Transportation Management Association. In the midtown area of downtown Boston, several other major projects will be in the construction and leasing stages over the same time frame as the Kingston-Bedford-Essex parcel, as discussed in the discussion of the No Build Alternative. To help integrate the transportation planning for Commonwealth Center and Lafayette Place with the Kingston-Bedford-Essex planning, the developer has already participated in joint meetings to discuss issues of common concern. To extend this cooperation to address ongoing issues as the projects are completed and leased, this group should continue to meet.

In the long-term, the group could evolve into what is known in transportation circles as a "transportation management association (TMA). These types of groups which were originated by the private sector to help reduce traffic congestion in suburban California areas, typically involve developers, major employers, community groups, and public agencies with an interest in improving transportation conditions in a given district. The role for a TMA in this area would include such issues as coordinating construction management for the projects, working with the City to insure the implementation of programmed street improvements, deciding on circulation options, monitoring traffic and parking conditions as the projects are leased up, and representing the area's interests with respect to major projects such as the Central Artery/Third Harbor Tunnel and future MBTA initiatives.